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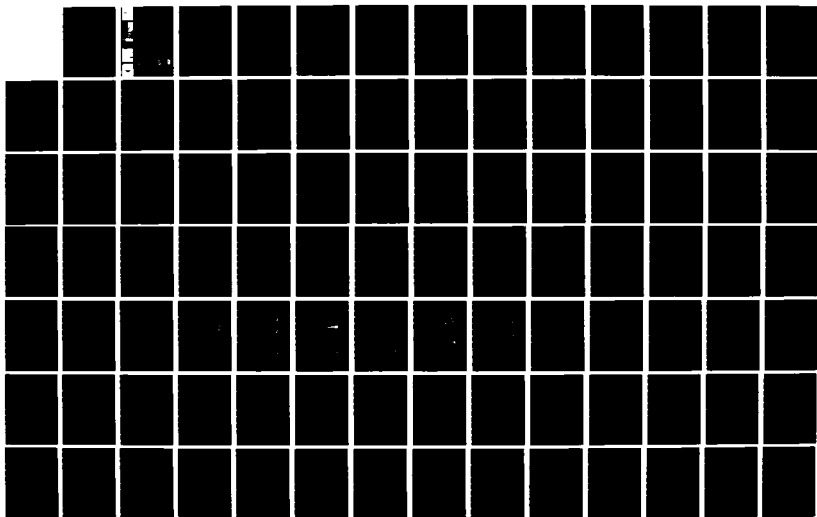
WAVE CLIMATOLOGY STUDY FOR LUDINGTON HARBOR MICHIGAN  
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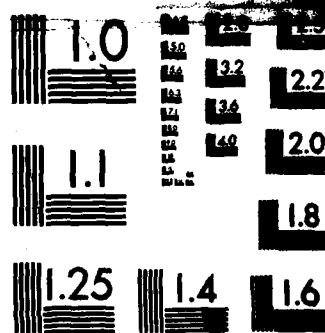
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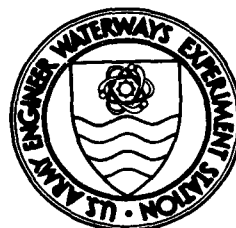
# WAVE CLIMATOLOGY STUDY FOR LUDINGTON HARBOR, MICHIGAN

by

George M. Horsham

Coastal Engineering Research Center

DEPARTMENT OF THE ARMY  
Waterways Experiment Station, Corps of Engineers  
PO Box 631  
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June 1985

Final Report

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Prepared for

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Detroit, Michigan 48231-1027

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)  Two wave gauges were operated at Ludington Harbor, Michigan, from May 1983 to December 1984. The objective of the study was to determine the relation- ship of wave action in the harbor with wave action occurring in Lake Michigan. One gauge was located in Lake Michigan just outside the harbor; the other was located in the interior channel near ferry terminal number 1. Concurrent wind data were obtained at the Ludington Harbor Coast Guard Station. Interpreta- tion of the results and conclusions are presented.			

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# PREFACE

The study described herein was performed at the request of the US Army Engineer District, Detroit, and was authorized on 5 April 1983.

The study was conducted from May 1983 to September 1984. From May 1983 to July 1983, the study was performed at the US Army Engineer Waterways Experiment Station (WES), Hydraulics Laboratory (HL), under the direction of Mr. H. B. Simmons, Chief, Mr. C. E. Chatham, Acting Chief, Wave Dynamics Division (WDD), and Mr. D. G. Outlaw, Acting Chief, Wave Processes Branch. From July 1983 to September 1984, the study was performed at WES in the Coastal Engineering Research Center (CERC), under the direction of Dr. R. W. Whalin, Chief, Dr. Fred Camfield, Acting Chief, Engineering Development Division (EDD), and Dr. Dennis R. Smith, Chief, Prototype Measurement and Analysis Branch. CPT George M. Horsham conducted the study and prepared this report.

Commanders and Directors of WES during the performance of the study and preparation and publication of this report were COL Tilford C. Creel, CE, and COL Robert C. Lee, CE. Technical Director was Mr. Fred R. Brown.

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CONVERSION FACTORS, NON-SI TO SI (METRIC)  
UNITS OF MEASUREMENT

Non-SI units of measurement used in this report can be converted to SI (metric) units as follows:

<u>Multiply</u>	<u>By</u>	<u>To Obtain</u>
feet	0.3048	metres
miles (US statute)	1.609347	kilometres
pounds (mass)	0.4535924	kilograms
slugs (mass) per cubic foot	515.3788	kilograms per cubic metre



## WAVE CLIMATOLOGY STUDY FOR LUDINGTON HARBOR, MICHIGAN

### PART I: INTRODUCTION

1. At the request of the US Army Engineer District, Detroit, the Coastal Engineering Research Center (CERC) of the US Army Engineer Waterways Experiment Station (WES) submitted a proposal for conducting a wave climatology study of Ludington Harbor, Michigan. The proposal was accepted, and funds for the study were authorized on 5 April 1983.

2. The primary objective of the study was to measure wave conditions in Lake Michigan in the vicinity of the harbor entrance and, simultaneously, in the Ludington Harbor channel. The acquired wave data were then used to characterize the relationship between wave conditions in the inner harbor with those occurring in the lake.

3. Ludington Harbor, Michigan, is located on the eastern shore of Lake Michigan, about 153 miles\* northeast of Chicago, Illinois, and 60 miles north of Muskegon, Michigan (Figure 1). The harbor is configured as an outer basin formed by two shore-connected arrowhead breakwaters and an inner channel which connects the outer basin with the northern end of Pere Marquette Lake where the lake ferry berthing facilities are located (Figure 2).

4. The scope of work of the study included design, deployment, maintenance, and recovery of two wave measurement systems, reduction and analysis of acquired wave data, correlation of observed wind and wave conditions, and evaluation of results.

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\* A table of factors for converting non-SI units of measurement to SI (metric) units is presented on page 3.

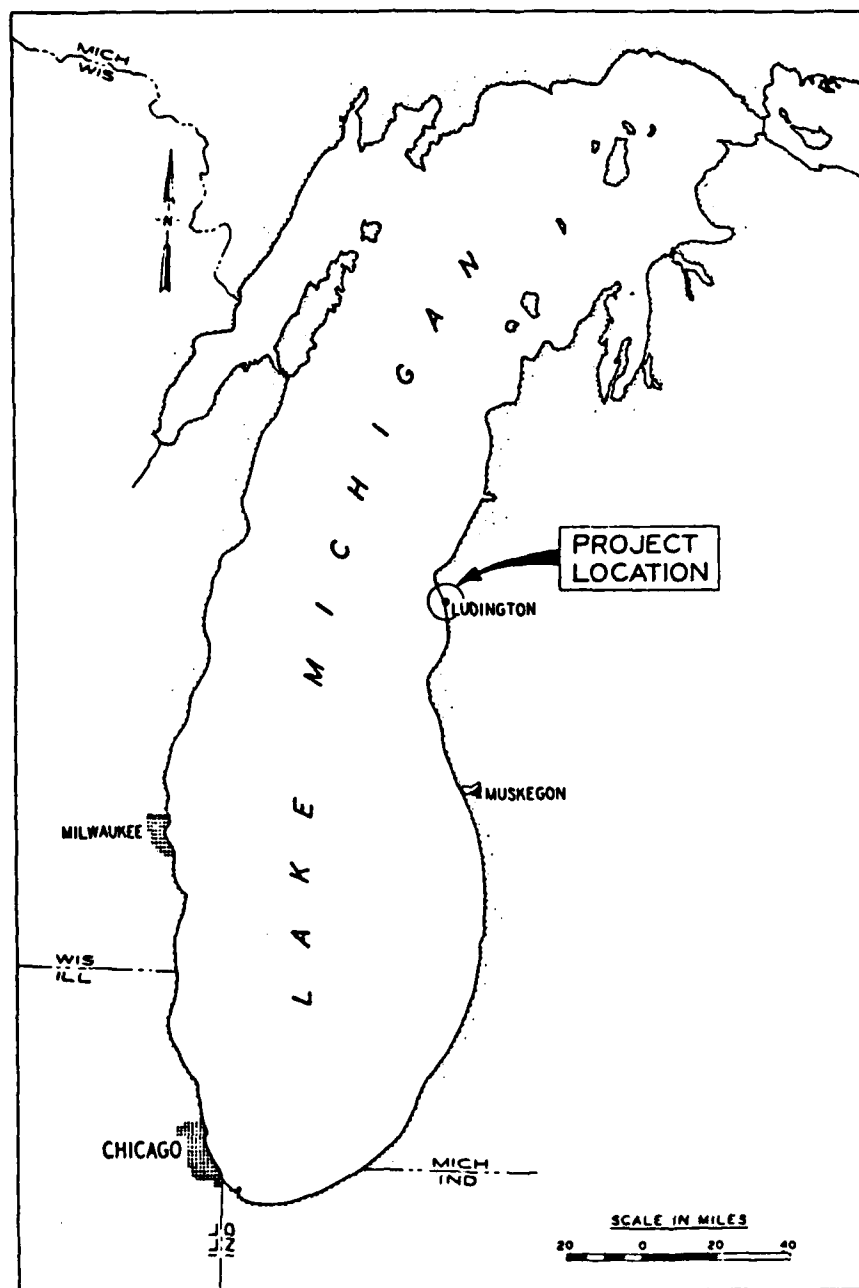


Figure 1. Vicinity map

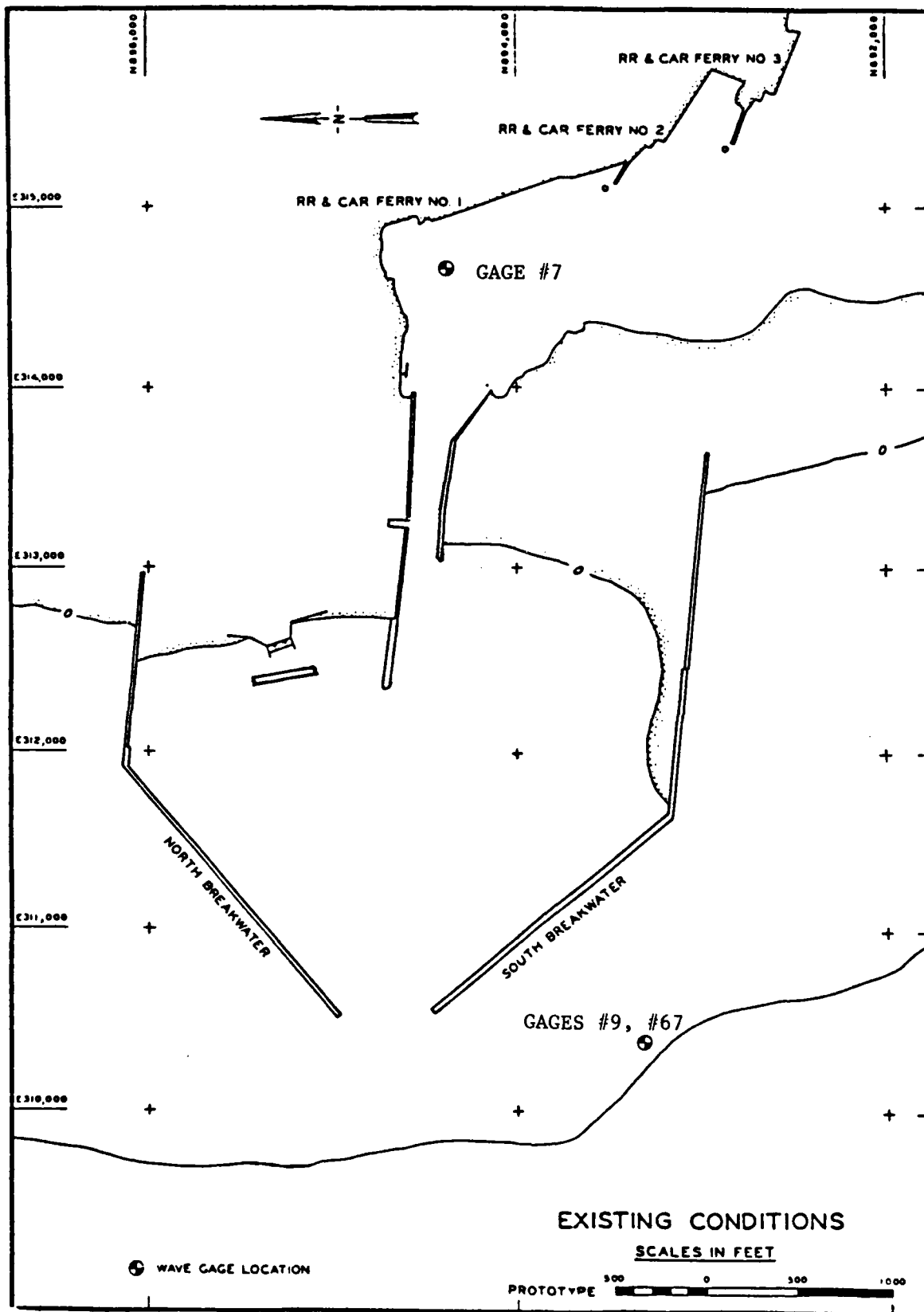


Figure 2. Wave gage locations

## PART II: WAVE MEASUREMENT SYSTEM

5. Each of the two wave measurement systems employed in the study consisted of a tripod instrumentation platform, wave gage, acoustic location device, steel mooring cable and float, and a lighted witness buoy. Figure 3 is a schematic depiction of the system. The wave gages are self-contained, internal recording pressure sensing instruments. The gages were configured to acquire 1,024 pressure samples  $N$  at a rate of 1 Hz, resulting in record lengths of 1,024 sec  $T$ , or about 17 min. A wave record was acquired every 2 hr.

6. The wave measurement systems were initially deployed on 26 May 1983 with the assistance of Grand Haven Area Office, CE, personnel. Gage 9 was deployed in Lake Michigan; Gage 7 was deployed at the east end of Ludington Harbor Channel. Site selection for placement of the gages was made after reviewing information presented in the physical model study of Ludington Harbor.\* The gages were serviced at approximately 60-day intervals. During the October 1983 servicing, Gage 9 was found to be defective and was replaced by Gage 67. The gages were retrieved from the measurement sites on 10 December 1983.

7. Table 1 provides a wave data statistical analysis summary, and Tables 2-4 provide a wave data record summary for Gages 7 and 9. Significant wave height versus time data for Gages 7, 9, and 67 are presented in Plates 1-6.

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\* L. G. Crosby and C. E. Chatham, Jr. 1975 (Sep). "Design of Entrance Channel Improvements for Ludington Harbor, Michigan; Hydraulic Model Investigation," Technical Report H-75-14, US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

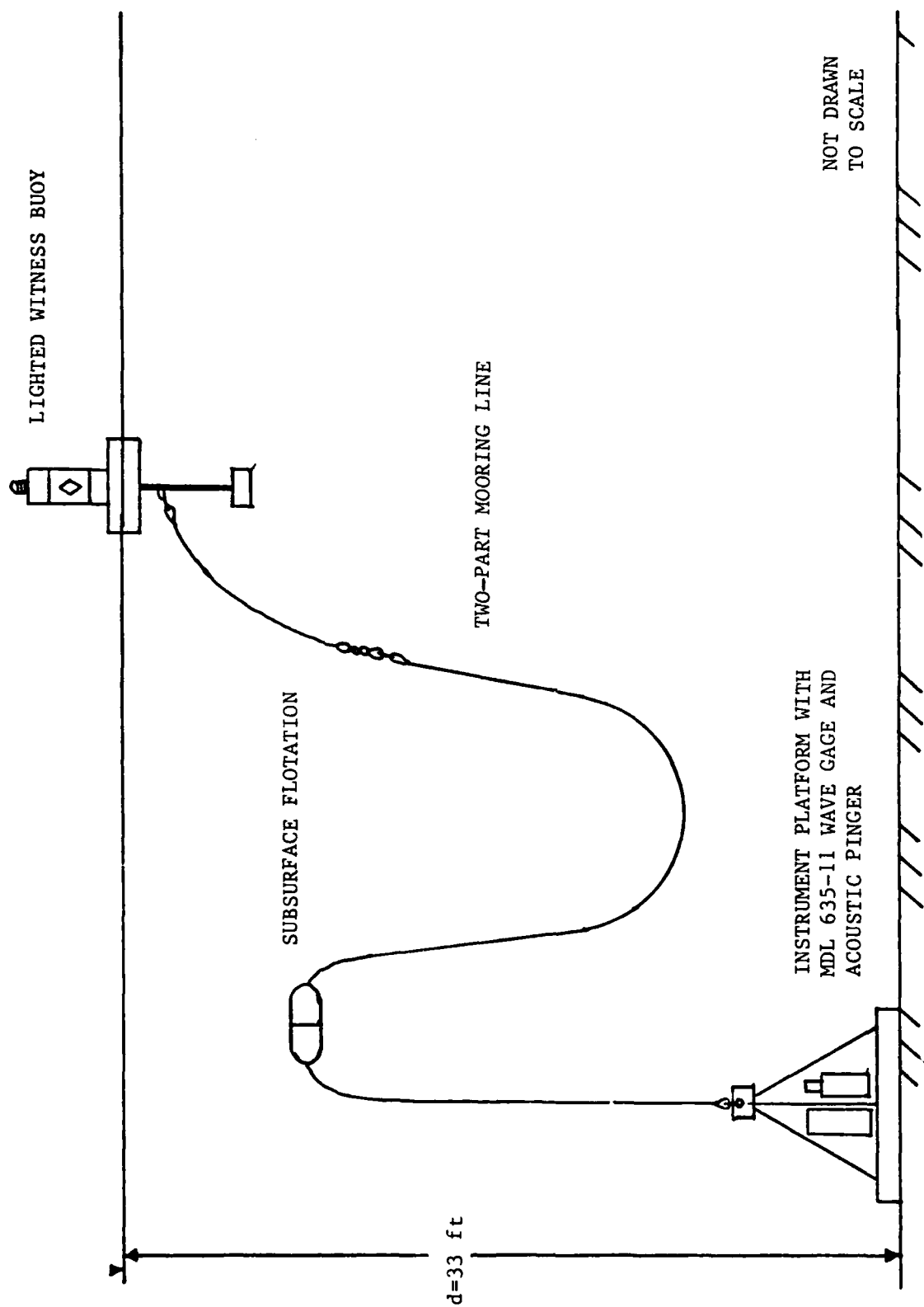


Figure 3. Wave gage measurement system

### PART III: DATA PROCESSING AND ANALYSIS

8. The raw data were examined and edited for bad data points. Those wave records which contained greater than a selected small percentage of bad data points were discarded. The edited wave records then were spectrally analyzed via a Fast Fourier Transform algorithm. The appropriate depth response factor was applied to each frequency band, and pertinent statistics were computed. The computed statistics include significant wave height  $H_s$ , peak period  $T_s$ , and spectral density plots for selected wave records (Appendix B). The spectral plot scaling factor is constant to allow direct intercomparison of results. The plots are useful for intercomparison of wave conditions in the lake and channel at corresponding times. Appendix A provides details of the wave data processing procedure.

9. Wind direction, wind speed, and significant wave height measured at both locations were correlated as functions of time during periods of significant wave activity. The correlation procedure consisted of plotting wind-speed, wind direction, and significant wave heights as ordinate values and times as the abscissa (Appendix B).

Table 2 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)
341	174	1410	0	227.556	0.088	341	174	1410	0	227.556	0.223
342	174	1410	0	227.556	0.065	342	174	1410	0	227.556	0.293
343	174	1410	0	227.556	0.061	343	174	1410	0	227.556	0.216
344	174	1410	0	227.556	0.079	344	174	1410	0	227.556	0.366
345	174	1410	0	227.556	0.046	345	174	1410	0	227.556	0.331
346	174	1410	0	227.556	0.111	346	174	1410	0	227.556	0.188
347	174	1410	0	227.556	0.166	347	174	1410	0	227.556	0.168
348	174	1410	0	227.556	0.082	348	174	1410	0	227.556	0.222
349	174	1410	0	227.556	0.059	349	174	1410	0	227.556	0.150
350	174	1410	0	227.556	0.178	350	174	1410	0	227.556	0.165
351	174	1410	0	227.556	0.050	351	174	1410	0	227.556	0.121
352	174	1410	0	227.556	0.156	352	174	1410	0	227.556	0.067
353	174	1410	0	227.556	0.147	353	174	1410	0	227.556	0.067
354	174	1410	0	227.556	0.049	354	174	1410	0	227.556	0.251
355	174	1410	0	227.556	0.266	355	174	1410	0	227.556	0.099
356	174	1410	0	227.556	0.220	356	174	1410	0	227.556	0.192
357	174	1410	0	227.556	0.235	357	174	1410	0	227.556	0.349
358	174	1410	0	227.556	0.082	358	174	1410	0	227.556	0.351
359	174	1410	0	227.556	0.113	359	174	1410	0	227.556	0.072
360	174	1410	0	227.556	0.200	360	174	1410	0	227.556	0.382
361	174	1410	0	227.556	0.176	361	174	1410	0	227.556	0.819
362	174	1410	0	227.556	0.137	362	174	1410	0	227.556	0.395
363	174	1410	0	227.556	0.137	363	174	1410	0	227.556	0.203
364	174	1410	0	227.556	0.240	364	174	1410	0	227.556	0.236
365	174	1410	0	227.556	0.090	365	174	1410	0	227.556	0.224
366	174	1410	0	227.556	0.119	366	174	1410	0	227.556	0.137
367	174	1410	0	227.556	0.116	367	174	1410	0	227.556	0.321
368	174	1410	0	227.556	0.111	368	174	1410	0	227.556	0.199
369	174	1410	0	227.556	0.057	369	174	1410	0	227.556	0.241
370	174	1410	0	227.556	0.080	370	174	1410	0	227.556	0.248
371	174	1410	0	227.556	0.067	371	174	1410	0	227.556	0.238
372	174	1410	0	227.556	0.112	372	174	1410	0	227.556	0.291
373	174	1410	0	227.556	0.219	373	174	1410	0	227.556	0.191
374	174	1410	0	227.556	0.158	374	174	1410	0	227.556	0.197
375	174	1410	0	227.556	0.075	375	174	1410	0	227.556	0.101
376	174	1410	0	227.556	0.065	376	174	1410	0	227.556	0.092
377	174	1410	0	227.556	0.087	377	174	1410	0	227.556	0.266
378	174	1410	0	227.556	0.085	378	174	1410	0	227.556	0.229
379	174	1410	0	227.556	0.127	379	174	1410	0	227.556	0.481
380	174	1410	0	227.556	0.095	380	174	1410	0	227.556	0.228
381	174	1410	0	227.556	0.210	381	174	1410	0	227.556	0.309
382	174	1410	0	227.556	0.064	382	174	1410	0	227.556	0.384
383	174	1410	0	227.556	0.109	383	174	1410	0	227.556	0.494
384	174	1410	0	227.556	0.148	384	174	1410	0	227.556	0.520
385	174	1410	0	227.556	0.087	385	174	1410	0	227.556	0.377
386	174	1410	0	227.556	0.107	386	174	1410	0	227.556	0.372
387	174	1410	0	227.556	0.145	387	174	1410	0	227.556	0.362
388	174	1410	0	227.556	0.094	388	174	1410	0	227.556	0.273
389	174	1410	0	227.556	0.110	389	174	1410	0	227.556	0.356
390	174	1410	0	227.556	0.066	390	174	1410	0	227.556	0.391
391	174	1410	0	227.556	0.122	391	174	1410	0	227.556	0.175
392	174	1410	0	227.556	0.076	392	174	1410	0	227.556	0.211
393	174	1410	0	227.556	0.134	393	174	1410	0	227.556	0.220
394	174	1410	0	227.556	0.065	394	174	1410	0	227.556	0.381
395	174	1410	0	227.556	0.045	395	174	1410	0	227.556	0.671
396	174	1410	0	227.556	0.137	396	174	1410	0	227.556	4.481
397	174	1410	0	227.556	0.247	397	174	1410	0	227.556	3.931
398	174	1410	0	227.556	0.222	398	174	1410	0	227.556	0.708
399	174	1410	0	227.556	0.052	399	174	1410	0	227.556	0.631
400	174	1410	0	227.556	0.052	400	174	1410	0	227.556	0.499
401	174	1410	0	227.556	0.052	401	174	1410	0	227.556	5.673
402	174	1410	0	227.556	0.052	402	174	1410	0	227.556	0.388
403	174	1410	0	227.556	0.052	403	174	1410	0	227.556	0.292

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(Sheet 7 of 13)

Table 2 (Continued)

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281	169	1630	0	227.556	0.044	281	169	830	0	227.556	0.090
282	169	1830	0	227.556	0.043	282	169	1030	0	227.556	0.104
283	169	2030	0	227.556	0.209	283	169	1230	0	227.556	0.161
284	169	2230	0	227.556	0.167	284	169	1430	0	227.556	0.128
285	169	2430	0	227.556	0.072	285	169	1630	0	227.556	0.117
286	169	2630	0	227.556	0.056	286	169	1830	0	227.556	0.193
287	169	2830	0	227.556	0.071	287	169	2030	3	4.819	0.222
288	169	3030	0	227.556	0.057	288	169	2230	0	227.556	0.164
289	170	0330	0	227.556	0.100	289	170	0530	0	227.556	0.128
290	170	0530	0	227.556	0.057	290	170	0730	0	227.556	0.122
291	170	0930	0	227.556	0.046	291	170	1130	0	227.556	0.090
292	170	1330	0	227.556	0.072	292	170	1530	0	227.556	0.110
293	170	1530	0	227.556	0.056	293	170	1730	17	227.556	0.110
294	170	1830	0	227.556	0.073	294	170	1930	0	227.556	0.183
295	170	2030	0	227.556	0.110	295	170	2130	3	227.556	0.134
296	170	2230	0	227.556	0.110	296	170	2330	0	227.556	0.113
297	171	0130	0	227.556	0.133	297	170	2430	0	227.556	0.161
298	171	0330	0	227.556	0.212	298	170	2530	0	227.556	0.246
299	171	0530	0	227.556	0.043	299	170	2630	0	227.556	0.183
300	171	0730	0	227.556	0.038	300	170	2730	0	227.556	0.334
301	171	0930	0	227.556	0.254	301	170	2830	0	227.556	0.274
302	171	1130	0	227.556	0.067	302	171	0130	0	227.556	0.250
303	171	1330	0	227.556	0.163	303	171	0330	0	227.556	0.214
304	171	1530	0	227.556	0.169	304	171	0530	0	227.556	0.210
305	171	1730	0	227.556	0.093	305	171	0730	0	227.556	0.159
306	171	1930	0	227.556	0.069	306	171	0930	0	227.556	0.172
307	171	2130	0	227.556	0.104	307	171	1030	0	227.556	0.201
308	171	2330	0	227.556	0.232	308	171	1230	0	227.556	0.163
309	172	0130	0	227.556	0.130	309	171	1430	0	227.556	0.173
310	172	0330	0	227.556	0.114	310	171	1630	0	227.556	0.310
311	172	0530	0	227.556	0.091	311	171	1830	0	227.556	0.128
312	172	0730	0	227.556	0.169	312	171	2030	0	227.556	0.495
313	172	0930	5	227.556	0.070	313	171	2230	0	227.556	0.153
314	172	1130	0	227.556	0.153	314	172	0130	0	227.556	0.152
315	172	1330	0	227.556	0.129	315	172	0330	0	227.556	0.161
316	172	1530	0	227.556	0.141	316	172	0530	0	227.556	0.121
317	172	1730	0	227.556	0.062	317	172	0730	0	227.556	0.066
318	172	1930	0	227.556	0.063	318	172	0930	0	227.556	0.261
319	172	2130	0	227.556	0.156	319	172	1130	0	227.556	0.200
320	172	2330	0	227.556	0.176	320	172	1330	0	227.556	0.203
321	173	0130	0	227.556	0.104	321	172	1530	0	227.556	0.197
322	173	0330	0	227.556	0.088	322	172	1730	0	227.556	0.189
323	173	0530	0	227.556	0.114	323	172	1930	0	227.556	0.165
324	173	0730	0	227.556	0.101	324	172	2130	0	227.556	0.218
325	173	0930	0	227.556	0.190	325	173	0130	0	227.556	0.219
326	173	1130	0	227.556	0.099	326	173	0330	0	227.556	0.131
327	173	1330	0	227.556	0.124	327	173	0530	0	227.556	0.124
328	173	1530	0	227.556	0.077	328	173	0730	0	227.556	0.168
329	173	1730	0	227.556	0.174	329	173	0930	0	227.556	0.090
330	173	1930	0	227.556	0.075	330	173	1130	0	227.556	0.176
331	173	2130	0	227.556	0.075	331	173	1330	0	227.556	0.171
332	173	2330	0	227.556	0.135	332	173	1530	0	227.556	0.232
333	174	0130	0	227.556	0.109	333	173	1730	0	227.556	0.336
334	174	0330	0	227.556	0.092	334	173	1930	0	227.556	0.433
335	174	0530	0	227.556	0.043	335	173	2130	0	227.556	0.190
336	174	0730	0	227.556	0.087	336	173	2330	0	227.556	0.4819
337	174	0930	0	227.556	0.155	337	174	0130	0	227.556	0.186
338	174	1130	0	227.556	0.087	338	174	0330	0	227.556	0.153
339	174	1330	0	227.556	0.075	339	174	0530	0	227.556	0.198
											0.200

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Table 2 (Continued)

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222	164	1330	0	227.556	0.052	222	164	1030	0	227.556	0.204
223	164	2030	0	227.556	0.086	223	164	1230	0	227.556	0.147
224	164	2230	0	227.556	0.061	224	164	1430	0	227.556	0.214
225	165	30	0	227.556	0.040	225	164	1630	0	6.055	0.159
226	165	230	0	227.556	0.049	226	164	1830	0	3.703	0.089
227	165	430	0	227.556	0.032	227	164	2030	0	227.556	0.136
228	165	630	0	227.556	0.078	228	164	2230	0	227.556	0.127
229	165	830	0	227.556	0.061	229	165	30	0	227.556	0.132
230	165	1030	0	227.556	0.067	230	165	230	0	227.556	0.175
231	165	1230	0	227.556	0.116	231	165	430	0	227.556	0.128
232	165	1430	0	227.556	0.116	232	165	630	0	227.556	0.158
233	165	1630	0	227.556	0.078	233	165	830	0	227.556	0.135
234	165	1830	0	227.556	0.094	234	165	1030	0	227.556	0.104
235	165	2030	0	227.556	0.090	235	165	1230	0	227.556	0.317
236	165	2230	0	227.556	0.144	236	165	1430	0	3.703	0.518
237	166	30	0	227.556	0.119	237	165	1630	0	3.703	0.766
238	166	270	0	227.556	0.244	238	165	1830	0	6.055	0.918
239	166	430	0	227.556	0.312	239	165	2030	0	3.931	0.826
240	166	630	0	227.556	0.186	240	165	2230	2	3.814	0.844
241	166	830	0	227.556	0.198	241	166	30	0	227.556	0.743
242	166	1030	0	227.556	0.093	242	166	230	0	6.055	0.612
243	166	1230	0	227.556	0.106	243	166	430	0	3.814	0.572
244	166	1430	0	227.556	0.198	244	166	630	1	6.055	0.694
245	166	1630	0	227.556	0.096	245	166	830	0	3.931	0.776
246	166	1830	0	227.556	0.185	246	166	1030	0	6.188	0.674
247	166	2030	0	227.556	0.262	247	166	1230	0	3.814	0.697
248	166	2230	0	227.556	0.118	248	166	1430	0	3.703	0.318
249	167	30	0	227.556	0.254	249	166	1630	0	4.819	0.400
250	167	230	0	227.556	0.181	250	166	1830	0	3.814	1.056
251	167	430	0	227.556	0.093	251	167	230	0	227.556	0.619
252	167	630	0	227.556	0.141	252	167	430	0	3.814	1.248
253	167	830	0	227.556	0.126	253	167	630	0	3.703	0.965
254	167	1030	0	227.556	0.135	254	167	830	0	4.188	0.792
255	167	1230	0	227.556	0.057	255	167	1030	0	6.055	1.002
256	167	1430	0	227.556	0.044	256	167	1230	0	227.556	0.553
257	167	1630	0	227.556	0.060	257	167	1430	0	4.055	0.490
258	167	1830	0	227.556	0.069	258	167	1630	0	3.814	0.367
259	167	2030	0	227.556	0.185	259	167	1830	0	3.703	0.351
260	167	2230	0	227.556	0.060	260	167	2030	0	5.007	0.388
261	168	30	0	227.556	0.102	261	167	2230	0	3.703	0.326
262	168	230	0	227.556	0.081	262	168	30	0	227.556	0.078
263	168	430	0	227.556	0.056	263	168	230	0	227.556	0.080
264	168	630	0	227.556	0.081	264	168	430	0	227.556	0.083
265	168	830	0	227.556	0.056	265	168	630	0	3.007	0.169
266	168	1030	0	227.556	0.064	266	168	830	0	227.556	0.094
267	168	1230	0	227.556	0.064	267	168	1030	0	227.556	0.120
268	168	1430	0	227.556	0.043	268	168	1230	0	227.556	0.094
269	168	1630	0	227.556	0.090	269	168	1430	0	227.556	0.102
270	168	1830	0	227.556	0.062	270	168	1630	0	3.814	0.091
271	168	2030	0	227.556	0.187	271	168	1830	0	5.007	0.249
272	168	2230	0	227.556	0.069	272	168	2030	0	5.007	0.162
273	169	30	0	227.556	0.139	273	168	2230	0	227.556	0.125
274	169	230	0	227.556	0.123	274	168	30	0	227.556	0.086
275	169	430	0	227.556	0.160	275	169	230	0	227.556	0.132
276	169	630	0	227.556	0.126	276	169	430	0	227.556	0.146
277	169	830	0	227.556	0.123	277	169	630	0	227.556	0.146
278	169	1030	0	227.556	0.152	278	169	830	0	227.556	0.146
279	169	1230	0	227.556	0.152	279	169	1030	0	227.556	0.146
280	169	1430	0	227.556	0.048	280	169	1230	0	227.556	0.146

(Continued)

(Sheet 5 of 13)

Table 2 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)
163	159	2110	0	227.556	0.146	163	159	1230	0	227.556	0.117
164	159	2230	0	227.556	0.102	164	159	1230	0	227.556	0.137
165	160	2110	0	227.556	0.134	165	159	1630	0	227.556	0.120
166	160	2110	0	227.556	0.176	166	159	1830	0	227.556	0.107
167	160	2110	0	227.556	0.177	167	159	2030	0	227.556	0.134
168	160	2110	0	227.556	0.193	168	159	2030	0	227.556	0.176
169	160	2110	0	227.556	0.121	169	160	230	0	227.556	0.295
170	160	2110	0	227.556	0.253	170	160	230	0	227.556	0.203
171	160	2110	0	227.556	0.121	171	160	430	0	227.556	0.389
172	160	2110	0	227.556	0.121	172	160	430	0	227.556	0.450
173	160	2110	0	227.556	0.174	173	160	830	0	227.556	0.481
174	160	2110	0	227.556	0.192	174	160	1030	0	227.556	0.450
175	160	2110	0	227.556	0.098	175	160	1030	0	227.556	0.481
176	160	2110	0	227.556	0.098	176	160	1230	0	227.556	0.450
177	161	2110	0	227.556	0.042	177	160	1230	0	227.556	0.450
178	161	2110	0	227.556	0.042	178	160	1430	0	227.556	0.450
179	161	2110	0	227.556	0.092	179	160	1630	0	227.556	0.450
180	161	2110	0	227.556	0.092	180	160	1830	0	227.556	0.450
181	161	2110	0	227.556	0.092	181	160	2030	0	227.556	0.450
182	161	2110	0	227.556	0.144	182	160	2230	0	227.556	0.450
183	161	2110	0	227.556	0.181	183	161	230	0	227.556	0.450
184	161	2110	0	227.556	0.181	184	161	230	0	227.556	0.450
185	161	2110	0	227.556	0.111	185	161	230	0	227.556	0.450
186	161	2110	0	227.556	0.111	186	161	230	0	227.556	0.450
187	161	2110	0	227.556	0.111	187	161	230	0	227.556	0.450
188	161	2110	0	227.556	0.111	188	161	230	0	227.556	0.450
189	161	2110	0	227.556	0.111	189	161	230	0	227.556	0.450
190	162	2110	0	227.556	0.075	190	161	230	0	227.556	0.450
191	162	2110	0	227.556	0.075	191	161	230	0	227.556	0.450
192	162	2110	0	227.556	0.061	192	161	230	0	227.556	0.450
193	162	2110	0	227.556	0.126	193	162	230	0	227.556	0.450
194	162	2110	0	227.556	0.149	194	162	230	0	227.556	0.450
195	162	2110	0	227.556	0.049	195	162	230	0	227.556	0.450
196	162	2110	0	227.556	0.034	196	162	230	0	227.556	0.450
197	162	2110	0	227.556	0.098	197	162	230	0	227.556	0.450
198	162	2110	0	227.556	0.060	198	162	230	0	227.556	0.450
199	162	2110	0	227.556	0.238	199	162	230	0	227.556	0.450
200	162	2110	0	227.556	0.167	200	162	230	0	227.556	0.450
201	163	2110	0	227.556	0.109	201	162	230	0	227.556	0.450
202	163	2110	0	227.556	0.109	202	162	230	0	227.556	0.450
203	163	2110	0	227.556	0.065	203	162	230	0	227.556	0.450
204	163	2110	0	227.556	0.056	204	162	230	0	227.556	0.450
205	163	2110	0	227.556	0.110	205	162	230	0	227.556	0.450
206	163	2110	0	227.556	0.078	206	162	230	0	227.556	0.450
207	163	2110	0	227.556	0.058	207	163	230	0	227.556	0.450
208	163	2110	0	227.556	0.058	208	163	230	0	227.556	0.450
209	163	2110	0	227.556	0.058	209	163	230	0	227.556	0.450
210	163	2110	0	227.556	0.116	210	163	230	0	227.556	0.450
211	163	2110	0	227.556	0.096	211	163	230	0	227.556	0.450
212	163	2110	0	227.556	0.072	212	163	230	0	227.556	0.450
213	163	2110	0	227.556	0.049	213	163	230	0	227.556	0.450
214	164	2110	0	227.556	0.055	214	163	230	0	227.556	0.450
215	164	2110	0	227.556	0.055	215	163	230	0	227.556	0.450
216	164	2110	0	227.556	0.055	216	163	230	0	227.556	0.450
217	164	2110	0	227.556	0.055	217	163	230	0	227.556	0.450
218	164	2110	0	227.556	0.127	218	164	230	0	227.556	0.156
219	164	2110	0	227.556	0.112	219	164	230	0	227.556	0.100
220	164	2110	0	227.556	0.037	220	164	230	0	227.556	0.130
221	164	2110	0	227.556	0.081	221	164	230	0	227.556	0.117

(Continued)

Table 2 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)
104	154	2230	0	227.556	0.186	124	154	1430	0	227.556	0.212
105	155	230	0	227.556	0.148	125	154	1630	1	227.556	0.082
106	155	230	0	227.556	0.082	126	154	1830	0	227.556	0.087
107	155	230	0	227.556	0.024	127	154	2030	0	4.819	0.283
108	155	230	0	227.556	0.154	128	154	2230	1	4.819	0.112
109	155	230	0	227.556	0.193	129	155	30	0	227.556	0.110
110	155	1030	0	227.556	0.154	130	155	230	0	227.556	0.092
111	155	1230	0	227.556	0.070	131	155	430	0	227.556	0.119
112	155	1430	0	227.556	0.049	132	155	630	0	227.556	0.153
113	155	1630	0	227.556	0.079	133	155	830	0	227.556	0.212
114	155	1830	0	227.556	0.154	134	155	1030	0	227.556	0.164
115	155	2030	0	227.556	0.157	135	155	1230	0	227.556	0.105
116	155	2230	0	227.556	0.135	136	155	1430	0	227.556	0.181
117	156	30	0	227.556	0.123	137	155	1630	0	227.556	0.175
118	156	230	0	227.556	0.095	138	155	1830	0	227.556	0.153
119	156	430	0	227.556	0.112	139	155	2030	0	4.819	0.340
120	156	630	0	227.556	0.177	140	155	2230	0	227.556	0.364
121	156	830	0	227.556	0.064	141	156	30	0	227.556	0.235
122	156	1030	0	227.556	0.108	142	156	230	0	3.814	0.114
123	156	1230	0	227.556	0.079	143	156	430	0	4.188	0.458
124	156	1430	0	227.556	0.126	144	156	630	0	5.814	0.596
125	156	1630	0	227.556	0.090	145	156	830	0	3.703	0.441
126	156	1830	0	227.556	0.124	146	156	1030	0	227.556	0.357
127	156	2030	0	227.556	0.174	147	156	1230	0	1.703	0.188
128	156	2230	0	227.556	0.089	148	156	1430	0	227.556	0.264
129	157	30	0	227.556	0.238	149	156	1630	0	227.556	0.219
130	157	230	0	227.556	0.084	150	156	1830	0	227.556	0.333
131	157	430	0	227.556	0.296	151	156	2030	0	227.556	0.155
132	157	630	0	227.556	0.061	152	156	2230	0	227.556	0.155
133	157	830	0	227.556	0.256	153	157	30	0	227.556	0.155
134	157	1030	0	227.556	0.179	154	157	230	0	227.556	0.306
135	157	1230	0	227.556	0.100	155	157	430	0	227.556	0.280
136	157	1430	0	227.556	0.071	156	157	630	0	227.556	0.308
137	157	1630	0	227.556	0.104	157	157	830	0	227.556	0.102
138	157	1830	0	227.556	0.082	158	157	1030	0	227.556	0.305
139	157	2030	0	227.556	0.101	159	157	1230	0	227.556	0.174
140	157	2230	0	227.556	0.183	160	157	1430	0	227.556	0.068
141	158	30	0	227.556	0.183	161	157	1630	0	227.556	0.134
142	158	230	0	227.556	0.159	162	157	1830	0	227.556	0.123
143	158	430	0	4.644	0.304	163	157	2030	0	227.556	0.224
144	158	630	0	227.556	0.369	164	157	2230	0	3.703	1.008
145	159	830	0	1.031	0.277	165	159	30	0	4.055	1.991
146	159	1030	0	227.556	0.148	166	159	230	0	4.055	2.260
147	159	1230	0	227.556	0.119	167	158	430	0	4.644	2.691
148	158	1430	0	227.556	0.075	168	158	630	0	4.819	2.599
149	158	1630	0	227.556	0.075	169	158	830	0	4.644	1.887
150	158	1830	0	227.556	0.072	170	158	1030	0	4.819	1.256
151	158	2030	0	227.556	0.164	171	158	1230	0	4.481	0.874
152	158	2230	0	227.556	0.057	172	158	1430	1	4.330	0.667
153	159	30	0	227.556	0.103	173	158	1630	0	4.330	0.490
154	159	230	0	227.556	0.070	174	158	1830	0	4.481	0.426
155	159	430	0	227.556	0.067	175	158	2030	0	4.330	0.312
156	159	630	0	227.556	0.030	176	158	2230	0	227.556	0.268
157	159	830	0	227.556	0.074	177	159	30	0	3.814	0.256
158	159	1030	0	227.556	0.040	178	159	230	0	227.556	0.159
159	159	1230	0	227.556	0.038	179	159	430	0	3.703	0.122
160	159	1430	0	227.556	0.081	180	159	630	0	227.556	0.168
161	159	1630	0	227.556	0.075	181	159	830	0	4.644	0.168
162	159	1830	0	227.556	0.063	182	159	1030	0	227.556	0.145

(Continued)

(Sheet 3 of 13)

Table 2 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)
45	150	30	0	227.554	0.095	45	149	1430	0	3.703	0.484
46	150	230	0	227.554	0.082	46	149	1430	0	227.556	0.349
47	150	430	0	227.556	0.236	47	149	2030	0	227.556	0.418
48	150	430	0	227.556	0.221	48	149	2330	0	227.556	0.405
49	150	1030	0	227.556	0.129	49	150	30	0	227.556	0.291
50	150	1030	0	227.556	0.129	50	150	230	0	227.556	0.304
51	150	1230	0	227.556	0.091	51	150	430	0	3.703	0.345
52	150	1430	0	227.556	0.116	52	150	430	0	227.556	0.252
53	150	1830	0	227.556	0.073	53	150	830	0	227.556	0.308
54	150	1830	0	227.556	0.059	54	150	1030	0	227.556	0.284
55	150	2030	19	4.055	0.112	55	150	1230	0	3.703	0.284
56	150	2230	0	227.556	0.029	56	150	1430	0	3.814	0.254
57	151	30	0	227.556	0.061	57	150	1430	0	3.703	0.254
58	151	230	0	227.556	0.030	58	150	1830	0	3.814	0.254
59	151	430	0	227.556	0.266	59	150	2030	0	227.556	0.150
60	151	830	0	227.556	0.032	60	150	2230	0	4.188	0.300
61	151	1030	0	227.556	0.045	61	151	30	0	3.703	0.256
62	151	1230	0	227.556	0.052	62	151	230	0	3.814	0.282
63	151	1430	0	227.556	0.214	63	151	430	0	3.814	0.280
64	151	1630	0	227.556	0.077	64	151	830	0	4.819	0.378
65	151	1830	1	227.556	0.052	65	151	1030	0	3.703	0.384
66	151	2030	0	227.556	0.034	66	151	1230	0	3.814	0.163
67	151	2230	0	227.556	0.101	67	151	1430	0	3.814	0.145
68	151	30	0	227.556	0.037	68	151	1630	0	3.703	0.123
69	152	30	0	227.556	0.069	69	151	1830	0	227.556	0.115
70	152	230	0	227.556	0.070	70	151	2030	0	227.556	0.074
71	152	430	0	227.556	0.071	71	151	2230	0	4.819	0.096
72	152	630	0	227.556	0.115	72	151	30	0	227.556	0.125
73	152	830	0	227.556	0.146	73	152	230	0	227.556	0.102
74	152	1030	0	227.556	0.075	74	152	430	0	3.703	0.138
75	152	1230	0	227.556	0.113	75	152	630	0	3.814	0.144
76	152	1430	0	227.556	0.052	76	152	830	0	227.556	0.237
77	152	1630	0	227.556	0.155	77	152	1030	0	227.556	0.089
78	152	1830	0	227.556	0.092	78	152	1230	0	227.556	0.137
79	152	2030	0	227.556	0.019	79	152	1430	0	227.556	0.071
80	152	2230	0	227.556	0.143	80	152	1630	0	227.556	0.055
81	153	30	0	227.556	0.090	81	152	1830	0	227.556	0.163
82	153	230	0	227.556	0.033	82	152	2030	0	4.819	0.461
83	153	430	0	227.556	0.101	83	152	2230	0	4.819	0.098
84	153	630	0	227.556	0.033	84	153	30	0	4.055	0.199
85	153	830	0	227.556	0.096	85	153	230	0	227.556	0.190
86	153	1030	1	227.556	0.037	86	153	430	0	227.556	0.163
87	153	1230	0	227.556	0.079	87	153	630	0	3.814	0.112
88	153	1430	0	227.556	0.026	88	153	830	0	4.819	0.383
89	153	1630	0	227.556	0.118	89	153	1030	0	4.819	0.154
90	153	1830	0	227.556	0.093	90	153	1230	0	227.556	0.138
91	153	2030	0	227.556	0.032	91	153	1430	0	227.556	0.120
92	153	2230	0	227.556	0.065	92	153	1630	0	227.556	0.061
93	154	30	0	227.556	0.031	93	153	1830	0	227.556	0.107
94	154	230	0	227.556	0.031	94	153	2030	0	227.556	0.225
95	154	430	0	227.556	0.050	95	153	2230	0	4.819	0.225
96	154	630	0	227.556	0.176	96	153	30	0	4.819	0.149
97	154	830	0	227.556	0.133	97	154	230	0	3.814	0.136
98	154	1030	0	227.556	0.137	98	154	430	0	227.556	0.088
99	154	1230	0	227.556	0.093	99	154	630	0	227.556	0.127
100	154	1430	0	227.556	0.116	100	154	830	0	4.819	0.206
101	154	1630	0	227.556	0.061	101	154	1030	0	227.556	0.220
102	154	1830	0	227.556	0.107	102	154	1230	0	227.556	0.262
103	154	2030	0	227.556	0.107	103	154	1430	0	227.556	0.262

(Continued)

Table 2

## Wave Data Record Summary

## Ludington Harbor, Michigan

a. Gage 7; Ludington Harbor Channel  
 26 May 1983 - 25 July 1983  
 Data Recovery Rate: 98.6%

b. Gage 9; Lake Michigan Site  
 26 May 1983 - 27 July 1983  
 Data Recovery Rate: 82.7%

RECORD NUMBER	JULIAN DATE	TIME	RAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	RAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)
1	165	830	0	0.	0.	1	164	30	0	0.	0.
2	166	1030	1	0.	0.	2	166	230	0	0.	0.
3	166	1230	3	0.	0.	3	166	430	1	0.	0.
4	166	1430	0	227.556	0.060	4	166	630	1	0.	0.
5	166	1630	0	227.556	0.040	5	166	830	12	0.	0.
6	166	1830	16	227.556	0.028	6	166	1030	0	0.	0.
7	166	2030	0	227.556	0.048	7	166	1230	0	3.703	0.508
8	166	2230	0	227.556	0.068	8	166	1430	0	4.055	0.564
9	167	30	0	227.556	0.135	9	166	1630	0	3.814	0.569
10	167	230	0	227.556	0.045	10	166	1830	108	0.	0.
11	167	430	0	227.556	0.036	11	166	2030	842	0.	0.
12	167	630	913	0.	0.	12	166	2230	0	227.556	0.234
13	167	830	128	0.	0.	13	167	30	0	4.819	0.285
14	167	1030	0	227.556	0.074	14	167	230	0	227.556	0.251
15	167	1230	0	227.556	0.083	15	167	430	21	0.	0.
16	167	1430	0	227.556	0.093	16	167	630	0	227.556	0.167
17	167	1630	0	227.556	0.148	17	167	830	0	227.556	0.261
18	167	1830	1	227.556	0.058	18	167	1030	0	227.556	0.231
19	167	2030	0	227.556	0.126	19	167	1230	0	4.819	0.179
20	167	2230	0	227.556	0.107	20	167	1430	0	227.556	0.250
21	168	30	0	227.556	0.096	21	167	1630	0	3.703	0.322
22	168	230	0	227.556	0.068	22	167	1830	28	0.	0.
23	168	430	0	227.556	0.193	23	167	2030	0	227.556	0.146
24	168	630	1	227.556	0.059	24	167	2230	0	3.807	0.417
25	168	830	0	227.556	0.052	25	168	30	0	227.556	0.243
26	168	1030	0	227.556	0.052	26	168	230	0	3.703	0.247
27	168	1230	0	227.556	0.210	27	168	430	16	3.703	0.333
28	168	1430	0	227.556	0.162	28	168	630	0	3.703	0.256
29	168	1630	0	227.556	0.105	29	168	830	0	227.556	0.283
30	168	1830	0	227.556	0.269	30	168	1030	0	227.556	0.330
31	168	2030	0	227.556	0.186	31	168	1230	0	4.481	0.273
32	168	2230	0	227.556	0.081	32	168	1430	0	227.556	0.133
33	169	30	0	227.556	0.055	33	168	1630	0	227.556	0.131
34	169	230	0	227.556	0.132	34	168	1830	0	227.556	0.138
35	169	430	0	227.556	0.119	35	168	2030	0	4.819	0.400
36	169	630	0	227.556	0.128	36	168	2230	0	227.556	0.110
37	169	830	0	227.556	0.055	37	169	30	0	227.556	0.118
38	169	1030	0	227.556	0.191	38	169	230	0	227.556	0.109
39	169	1230	0	227.556	0.199	39	169	430	0	227.556	0.193
40	169	1430	0	227.556	0.205	40	169	630	0	3.814	0.290
41	169	1630	0	6.188	0.205	41	169	830	0	227.556	0.285
42	169	1830	0	227.556	0.136	42	169	1030	0	4.055	0.337
43	169	2030	0	227.556	0.284	43	169	1230	0	3.814	0.307
44	169	2230	0	227.556	0.293	44	169	1430	0	3.814	0.899

(Continued)

(Sheet 1 of 13)

Table 1 (Concluded)

HAND NUMBER (#)	WAVE FREQUENCY (HZ.)	WAVE PERIOD (SEC.)	VALID OBSERVATIONS (#)	PERCENT OF VALID RECORDS (%)	AVERAGE SIGNIFICANT HEIGHT (FT.)	STANDARD DEVIATION (FT.)	MAXIMUM OBSERVED SIGNIFICANT HEIGHT (FT.)	PROBABLE MAXIMUM WAVE HEIGHT (FT.)
1	0.004	227.556	195.0	28.6	0.5287	0.3888	2.3186	4.3358
2	0.012	81.920	1.0	0.1	1.2804	0.	1.2804	2.5944
3	0.020	49.951	0.	0.	0.	0.	0.	0.
4	0.029	35.930	0.	0.	0.	0.	0.	0.
5	0.036	28.055	0.	0.	0.	0.	0.	0.
6	0.043	23.011	0.	0.	0.	0.	0.	0.
7	0.051	19.505	0.	0.	0.	0.	0.	0.
8	0.059	16.926	0.	0.	0.	0.	0.	0.
9	0.067	14.949	0.	0.	0.	0.	0.	0.
10	0.075	13.536	0.	0.	0.	0.	0.	0.
11	0.083	12.118	0.	0.	0.	0.	0.	0.
12	0.090	11.070	0.	0.	0.	0.	0.	0.
13	0.098	10.189	0.	0.	0.	0.	0.	0.
14	0.106	9.438	0.	0.	0.	0.	0.	0.
15	0.114	8.790	11.0	1.6	2.2104	1.0863	5.2519	9.8211
16	0.122	8.225	25.0	3.7	2.7893	1.8491	8.1939	15.3225
17	0.129	7.728	18.0	2.6	2.9279	2.4602	7.9908	14.9428
18	0.137	7.288	23.0	3.4	3.5539	2.5586	8.7797	16.4180
19	0.145	6.846	25.0	3.7	2.4016	2.4973	7.6918	14.3836
20	0.153	6.543	26.0	3.8	2.8687	2.1552	8.2707	15.4662
21	0.161	6.225	26.0	3.8	3.2474	2.2917	7.7402	14.4741
22	0.168	5.936	28.0	4.1	2.9359	1.4306	5.8857	11.0063
23	0.176	5.673	27.0	4.0	2.2010	1.6535	8.0606	15.0233
24	0.184	5.432	29.0	4.1	2.3200	1.2242	4.6677	8.7286
25	0.192	5.211	19.0	2.8	2.3213	1.0333	4.1625	7.7838
26	0.200	5.007	21.0	3.1	1.4950	0.7449	3.1642	5.9171
27	0.208	4.819	25.0	3.7	1.3369	0.6399	2.6366	4.9305
28	0.215	4.644	16.0	2.3	1.0905	0.7976	3.4809	6.5092
29	0.223	4.481	20.0	2.9	0.9302	0.5756	2.4937	4.6631
30	0.231	4.330	12.0	1.8	0.9301	0.6271	2.4577	4.5958
31	0.239	4.188	19.0	2.8	1.1781	0.7769	2.8329	5.2975
32	0.247	4.055	20.0	2.9	0.8150	0.6439	2.6051	4.8716
33	0.254	3.931	29.0	4.2	0.8066	0.4631	2.1687	4.0554
34	0.262	3.814	32.0	4.7	0.7473	0.7968	4.6968	8.7830
35	0.270	3.703	37.0	5.4	0.8134	0.8811	4.5734	8.5323
36	0.278	3.599	0.	0.	0.	0.	0.	0.
37	0.286	3.501	0.	0.	0.	0.	0.	0.
38	0.293	3.408	0.	0.	0.	0.	0.	0.
39	0.301	3.319	0.	0.	0.	0.	0.	0.
40	0.309	3.235	0.	0.	0.	0.	0.	0.
41	0.317	3.156	0.	0.	0.	0.	0.	0.
42	0.325	3.080	0.	0.	0.	0.	0.	0.
43	0.333	3.007	0.	0.	0.	0.	0.	0.
44	0.341	2.938	0.	0.	0.	0.	0.	0.
45	0.348	2.872	0.	0.	0.	0.	0.	0.
46	0.356	2.809	0.	0.	0.	0.	0.	0.

(Sheet 6 of 6)

Table 1 (Continued)

BAND NUMBER (#)	WAVE FREQUENCY (MC.)	WAVE PERIOD (SEC.)	VALID OBSERVATIONS (#)	PERCENT OF VALID RECORDS (%)	AVERAGE SIGNIFICANT HEIGHT (FT.)	STANDARD DEVIATION (FT.)	MAXIMUM OBSERVED SIGNIFICANT HEIGHT (FT.)	PROBABLE MAXIMUM WAVE HEIGHT (FT.)
1	0.004	227.556	521.0	72.6	0.1606	0.1163	0.9795	1.8317
2	0.012	81.920	0.	0.	0.	0.	0.	0.
3	0.020	49.951	0.	0.	0.	0.	0.	0.
4	0.028	35.930	0.	0.	0.	0.	0.	0.
5	0.036	29.055	0.	0.	0.	0.	0.	0.
6	0.043	23.011	0.	0.	0.	0.	0.	0.
7	0.051	19.505	0.	0.	0.	0.	0.	0.
8	0.059	16.926	0.	0.	0.	0.	0.	0.
9	0.067	14.949	0.	0.	0.	0.	0.	0.
10	0.075	13.386	0.	0.	0.	0.	0.	0.
11	0.083	12.118	0.	0.	0.	0.	0.	0.
12	0.090	11.070	0.	0.	0.	0.	0.	0.
13	0.098	10.189	0.	0.	0.	0.	0.	0.
14	0.106	9.438	0.	0.	0.	0.	0.	0.
15	0.114	8.790	0.	0.	0.	0.	0.	0.
16	0.122	8.225	0.	0.	0.	0.	0.	0.
17	0.129	7.728	0.	0.	0.	0.	0.	0.
18	0.137	7.288	0.	0.	0.	0.	0.	0.
19	0.145	6.896	0.	0.	0.	0.	0.	0.
20	0.153	6.543	1.0	0.1	0.5260	0.	0.5260	0.9837
21	0.161	6.225	2.0	0.3	1.1567	0.0281	1.1765	2.2001
22	0.168	5.936	9.0	1.3	1.0159	0.1890	1.2623	2.3605
23	0.176	5.673	2.0	0.3	0.6390	0.1283	0.7297	1.3645
24	0.184	5.432	10.0	1.4	0.7934	0.1363	0.9982	1.8667
25	0.192	5.211	15.0	2.1	0.6224	0.3226	1.1875	2.2207
26	0.200	5.007	57.0	7.9	0.5868	0.2852	1.1652	2.1790
27	0.208	4.819	27.0	3.8	0.5188	0.3081	1.0929	2.0437
28	0.215	4.644	9.0	1.3	0.4949	0.2947	1.1245	2.1029
29	0.223	4.481	2.0	0.3	0.4556	0.4454	0.7706	1.4410
30	0.231	4.330	7.0	1.0	0.3799	0.1296	0.5393	1.0085
31	0.239	4.188	21.0	2.9	0.3199	0.2192	0.8565	1.6017
32	0.247	4.055	19.0	2.6	0.4386	0.2070	0.9197	1.7198
33	0.254	3.931	11.0	1.5	0.2679	0.1329	0.5999	1.1218
34	0.262	3.814	5.0	0.7	0.1645	0.1151	0.3614	0.6384
35	0.270	3.703	0.	0.	0.	0.	0.	0.
36	0.278	3.599	0.	0.	0.	0.	0.	0.
37	0.286	3.501	0.	0.	0.	0.	0.	0.
38	0.293	3.408	0.	0.	0.	0.	0.	0.
39	0.301	3.319	0.	0.	0.	0.	0.	0.
40	0.309	3.235	0.	0.	0.	0.	0.	0.
41	0.317	3.156	0.	0.	0.	0.	0.	0.
42	0.325	3.080	0.	0.	0.	0.	0.	0.
43	0.333	3.007	0.	0.	0.	0.	0.	0.
44	0.340	2.938	0.	0.	0.	0.	0.	0.
45	0.348	2.872	0.	0.	0.	0.	0.	0.
46	0.356	2.809	0.	0.	0.	0.	0.	0.

(Continued)

(Sheet 5 of 6)

Table 1 (Continued)

STATION NUMBER (#)	WAVE FREQUENCY (HZ.)	WAVE PERIOD (SEC.)	VALID OBSERVATIONS (#)	PERCENT OF VALID RECORDS (%)	AVERAGE SIGNIFICANT HEIGHT (FT.)	STANDARD DEVIATION (FT.)	MAXIMUM SIGNIFICANT HEIGHT (FT.)	PROBABLE MAXIMUM WAVE HEIGHT (FT.)
1	0.014	227.556	72.0	36.7	0.2886	0.1321	0.7749	1.4491
2	0.012	81.920	0.	0.	0.	0.	0.	0.
3	0.020	49.951	0.	0.	0.	0.	0.	0.
4	0.028	35.930	0.	0.	0.	0.	0.	0.
5	0.036	28.055	0.	0.	0.	0.	0.	0.
6	0.043	23.011	0.	0.	0.	0.	0.	0.
7	0.051	19.505	0.	0.	0.	0.	0.	0.
8	0.059	16.926	0.	0.	0.	0.	0.	0.
9	0.067	14.949	0.	0.	0.	0.	0.	0.
10	0.075	13.386	0.	0.	0.	0.	0.	0.
11	0.083	12.118	0.	0.	0.	0.	0.	0.
12	0.090	11.070	0.	0.	0.	0.	0.	0.
13	0.098	10.189	0.	0.	0.	0.	0.	0.
14	0.106	9.438	0.	0.	0.	0.	0.	0.
15	0.114	8.790	3.0	1.5	0.9633	0.0522	1.0234	1.9138
16	0.122	8.225	0.	0.	0.	0.	0.	0.
17	0.129	7.728	0.	0.	0.	0.	0.	0.
18	0.137	7.288	0.	0.	0.	0.	0.	0.
19	0.145	6.896	4.0	2.0	2.0985	1.6820	3.9030	7.2946
20	0.153	6.543	0.	0.	0.	0.	0.	0.
21	0.161	5.225	1.0	0.5	3.3137	0.	3.3137	6.1966
22	0.169	5.936	1.0	0.5	3.6791	0.	3.6791	6.8739
23	0.176	5.673	3.0	1.5	0.6541	0.7783	1.5529	2.9039
24	0.184	5.432	2.0	1.0	2.1846	2.8526	4.2016	7.8571
25	0.192	5.211	4.0	2.0	0.8649	0.9006	2.1943	4.1033
26	0.200	5.007	5.0	2.6	0.6799	0.4606	1.3708	2.5633
27	0.208	4.819	5.0	2.6	0.5176	0.6499	1.6793	3.1403
28	0.215	4.644	6.0	3.1	0.9729	1.0744	2.4561	4.5928
29	0.223	4.481	7.0	3.6	0.7678	0.9068	2.7127	5.0728
30	0.231	4.330	3.0	1.5	0.4486	0.2186	0.6412	1.1991
31	0.239	4.188	8.0	4.1	0.7303	0.4454	1.6016	2.9951
32	0.247	4.055	8.0	4.1	0.8116	0.3682	1.3896	2.5965
33	0.254	3.931	8.0	4.1	0.6890	0.5928	1.8819	3.5192
34	0.262	3.814	12.0	6.1	0.8059	0.5335	1.7645	3.2998
35	0.270	3.703	44.0	22.4	1.3047	1.4710	6.1057	11.4177
36	0.278	3.599	0.	0.	0.	0.	0.	0.
37	0.286	3.501	0.	0.	0.	0.	0.	0.
38	0.293	3.408	0.	0.	0.	0.	0.	0.
39	0.301	3.319	0.	0.	0.	0.	0.	0.
40	0.309	3.235	0.	0.	0.	0.	0.	0.
41	0.317	3.156	0.	0.	0.	0.	0.	0.
42	0.325	3.080	0.	0.	0.	0.	0.	0.
43	0.333	3.017	0.	0.	0.	0.	0.	0.
44	0.340	2.938	0.	0.	0.	0.	0.	0.
45	0.348	2.872	0.	0.	0.	0.	0.	0.
46	0.356	2.809	0.	0.	0.	0.	0.	0.

(Cont Inued)

(Sheet 4 of 6)

(Continued)

(Sheet 4 of 6)



Table 1 (Continued)

RAND NUMBER (#)	WAVE FREQUENCY (HZ.)	WAVE PERIOD (SEC.)	VALID OBSERVATIONS (#)	PERCENT OF VALID RECORDS (%)	AVERAGE SIGNIFICANT HEIGHT (FT.)	STANDARD DEVIATION (FT.)	MAXIMUM OBSERVED SIGNIFICANT HEIGHT (FT.)	PROBABLE MAXIMUM WAVE HEIGHT (FT.)
1	0.004	227.556	531.0	81.8	0.1686	0.1310	0.8597	1.6077
2	0.012	81.920	0.	0.	0.	0.	0.	0.
3	0.020	49.951	0.	0.	0.	0.	0.	0.
4	0.028	35.930	0.	0.	0.	0.	0.	0.
5	0.036	28.055	0.	0.	0.	0.	0.	0.
6	0.043	23.011	0.	0.	0.	0.	0.	0.
7	0.051	19.505	0.	0.	0.	0.	0.	0.
8	0.059	16.926	0.	0.	0.	0.	0.	0.
9	0.067	14.949	0.	0.	0.	0.	0.	0.
10	0.075	13.386	0.	0.	0.	0.	0.	0.
11	0.083	12.118	0.	0.	0.	0.	0.	0.
12	0.090	11.070	0.	0.	0.	0.	0.	0.
13	0.098	10.189	0.	0.	0.	0.	0.	0.
14	0.106	9.438	0.	0.	0.	0.	0.	0.
15	0.114	8.790	0.	0.	0.	0.	0.	0.
16	0.122	8.225	0.	0.	0.	0.	0.	0.
17	0.129	7.728	0.	0.	0.	0.	0.	0.
18	0.137	7.288	0.	0.	0.	0.	0.	0.
19	0.145	6.896	0.	0.	0.	0.	0.	0.
20	0.153	6.543	0.	0.	0.	0.	0.	0.
21	0.161	6.225	0.	0.	0.	0.	0.	0.
22	0.168	5.936	0.	0.	0.	0.	0.	0.
23	0.176	5.673	3.0	0.5	0.7953	0.1589	0.9730	1.8195
24	0.184	5.432	2.0	0.3	0.8267	0.1218	0.9129	1.7071
25	0.192	5.211	3.0	0.5	0.7045	0.4999	1.7451	2.1413
26	0.200	5.007	40.0	6.2	0.4771	0.3028	1.1847	2.2155
27	0.208	4.819	16.0	2.5	0.5098	0.2876	1.1458	2.1427
28	0.215	4.644	6.0	0.9	0.3325	0.2162	0.7648	1.4303
29	0.223	4.481	2.0	0.3	0.2536	0.1353	0.3493	0.6532
30	0.231	4.330	2.0	0.3	0.2098	0.0247	0.2273	0.4250
31	0.239	4.188	13.0	2.0	0.4122	0.1990	0.8998	1.6827
32	0.247	4.055	21.0	3.2	0.2293	0.1362	0.4769	0.8919
33	0.254	3.931	8.0	1.2	0.1696	0.1570	0.5056	0.9454
34	0.262	3.814	2.0	0.3	0.1621	0.0858	0.2227	0.4165
35	0.270	3.703	0.	0.	0.	0.	0.	0.
36	0.278	3.599	0.	0.	0.	0.	0.	0.
37	0.286	3.501	0.	0.	0.	0.	0.	0.
38	0.293	3.408	0.	0.	0.	0.	0.	0.
39	0.301	3.319	0.	0.	0.	0.	0.	0.
40	0.309	3.235	0.	0.	0.	0.	0.	0.
41	0.317	3.156	0.	0.	0.	0.	0.	0.
42	0.325	3.080	0.	0.	0.	0.	0.	0.
43	0.333	3.007	0.	0.	0.	0.	0.	0.
44	0.340	2.938	0.	0.	0.	0.	0.	0.
45	0.348	2.872	0.	0.	0.	0.	0.	0.
46	0.356	2.809	0.	0.	0.	0.	0.	0.

(Continued)

(Sheet 3 of 6)

Table 1 (Continued)

BAUD NUMBER (#)	WAVE FREQUENCY (HZ.)	WAVE PERIOD (SEC.)	VALID OBSERVATIONS (#)	PERCENT OF VALID RECORDS (%)	AVERAGE SIGNIFICANT HEIGHT (FT.)	STANDARD DEVIATION (FT.)	MAXIMUM OBSERVED SIGNIFICANT HEIGHT (FT.)	PROBABLE MAXIMUM WAVE HEIGHT (FT.)
1	0.004	227.556	309.0	50.0	0.2370	0.1889	1.6843	3.1496
2	0.012	81.920	0.	0.	0.	0.	0.	0.
3	0.020	49.951	0.	0.	0.	0.	0.	0.
4	0.028	35.930	0.	0.	0.	0.	0.	0.
5	0.036	28.055	0.	0.	0.	0.	0.	0.
6	0.043	23.011	0.	0.	0.	0.	0.	0.
7	0.051	19.505	0.	0.	0.	0.	0.	0.
8	0.059	16.926	0.	0.	0.	0.	0.	0.
9	0.067	14.949	0.	0.	0.	0.	0.	0.
10	0.075	13.386	0.	0.	0.	0.	0.	0.
11	0.083	12.118	0.	0.	0.	0.	0.	0.
12	0.090	11.070	0.	0.	0.	0.	0.	0.
13	0.098	10.189	0.	0.	0.	0.	0.	0.
14	0.106	9.438	0.	0.	0.	0.	0.	0.
15	0.114	8.790	0.	0.	0.	0.	0.	0.
16	0.122	8.225	0.	0.	0.	0.	0.	0.
17	0.129	7.728	0.	0.	0.	0.	0.	0.
18	0.137	7.288	0.	0.	0.	0.	0.	0.
19	0.145	6.896	1.0	0.2	0.2821	0.	0.2821	0.5276
20	0.153	6.543	2.0	0.3	0.7734	0.3879	1.0477	1.9593
21	0.161	6.225	2.0	0.3	0.4401	0.2700	0.6310	1.1800
22	0.168	5.936	7.0	1.1	2.4874	0.9481	4.1169	7.6985
23	0.176	5.673	2.0	0.3	1.1479	1.0747	1.9078	3.5677
24	0.184	5.432	4.0	0.6	0.3512	0.2188	0.6714	1.2556
25	0.192	5.211	11.0	1.8	1.0902	0.8903	3.0312	5.6684
26	0.200	5.007	15.0	2.4	0.8942	1.0701	3.9156	7.3222
27	0.208	4.819	42.0	6.8	0.5808	0.7356	3.0816	5.7626
28	0.215	4.644	14.0	2.3	1.1598	1.0871	3.7098	6.9374
29	0.223	4.481	20.0	3.2	1.1090	0.8730	2.9884	5.5883
30	0.231	4.330	12.0	1.9	1.1427	0.7864	2.5656	4.7977
31	0.239	4.188	17.0	2.8	0.9396	0.7557	2.8343	5.3002
32	0.247	4.055	28.0	4.3	0.9734	0.7638	3.0238	5.6546
33	0.254	3.931	19.0	3.1	0.9642	0.7057	2.7709	5.1817
34	0.262	3.814	36.0	5.8	0.6336	0.7458	3.3155	6.1999
35	0.270	3.703	75.0	12.1	0.7515	0.7981	3.3552	6.2742
36	0.278	3.599	2.0	0.3	0.2295	0.0613	0.2729	0.5103
37	0.286	3.501	0.	0.	0.	0.	0.	0.
38	0.293	3.408	0.	0.	0.	0.	0.	0.
39	0.301	3.319	0.	0.	0.	0.	0.	0.
40	0.309	3.235	0.	0.	0.	0.	0.	0.
41	0.317	3.156	0.	0.	0.	0.	0.	0.
42	0.325	3.080	0.	0.	0.	0.	0.	0.
43	0.333	3.007	0.	0.	0.	0.	0.	0.
44	0.340	2.938	0.	0.	0.	0.	0.	0.
45	0.348	2.872	0.	0.	0.	0.	0.	0.
46	0.356	2.809	0.	0.	0.	0.	0.	0.

(Continued)

(Sheet 2 of 6)

Table 1

Wave Data Statistical Analysis Summary, Ludington Harbor, Michigan, Gage 7; Ludington Harbor Channel, 26 May 1983 - 25 July 1983, Data Recovery Rate: 98.6%

DATA NUMBER (W)	WAVE FREQUENCY (Hz.)	WAVE PERIOD (SEC.)	VALID OBSERVATIONS (N)	PERCENT OF VALID RECORDS (%)	AVERAGE SIGNIFICANT HEIGHT (FT.)	STANDARD DEVIATION (FT.)	MAXIMUM SIGNIFICANT HEIGHT (FT.)	OBSERVED SIGNIFICANT HEIGHT (FT.)	PROBABLE MAXIMUM WAVE HEIGHT (FT.)
1	0.004	227.556	695.0	96.9	0.1485	0.1255	1.3932	1.3932	2.0443
2	0.012	31.920	0.	0.	0.	0.	0.	0.	0.
3	0.020	49.951	0.	0.	0.	0.	0.	0.	0.
4	0.028	35.930	0.	0.	0.	0.	0.	0.	0.
5	0.035	28.055	0.	0.	0.	0.	0.	0.	0.
6	0.043	23.011	0.	0.	0.	0.	0.	0.	0.
7	0.051	19.505	0.	0.	0.	0.	0.	0.	0.
8	0.059	16.926	0.	0.	0.	0.	0.	0.	0.
9	0.067	14.949	0.	0.	0.	0.	0.	0.	0.
10	0.075	13.386	0.	0.	0.	0.	0.	0.	0.
11	0.083	12.118	0.	0.	0.	0.	0.	0.	0.
12	0.090	11.070	0.	0.	0.	0.	0.	0.	0.
13	0.098	10.189	0.	0.	0.	0.	0.	0.	0.
14	0.106	9.438	0.	0.	0.	0.	0.	0.	0.
15	0.114	8.790	0.	0.	0.	0.	0.	0.	0.
16	0.122	8.225	0.	0.	0.	0.	0.	0.	0.
17	0.129	7.728	0.	0.	0.	0.	0.	0.	0.
18	0.137	7.288	0.	0.	0.	0.	0.	0.	0.
19	0.145	6.896	0.	0.	0.	0.	0.	0.	0.
20	0.153	6.543	0.	0.	0.	0.	0.	0.	0.
21	0.161	6.225	0.	0.	0.	0.	0.	0.	0.
22	0.169	5.936	0.	0.	0.	0.	0.	0.	0.
23	0.176	5.673	0.	0.	0.	0.	0.	0.	0.
24	0.184	5.422	0.	0.	0.	0.	0.	0.	0.
25	0.192	5.211	1.0	0.1	0.2392	0.	0.2392	0.2392	0.4473
26	0.200	5.007	1.0	0.1	0.2055	0.	0.2055	0.2055	0.3843
27	0.208	4.819	6.0	0.8	0.1476	0.0221	0.1759	0.1759	0.3289
28	0.215	4.644	4.0	0.6	0.2212	0.0850	0.3042	0.3042	0.5639
29	0.223	4.481	1.0	0.1	0.1864	0.	0.1864	0.1864	0.3436
30	0.231	4.330	1.0	0.1	0.1426	0.	0.1426	0.1426	0.2666
31	0.239	4.182	3.0	0.4	0.2610	0.2021	0.4851	0.4851	0.9072
32	0.247	4.055	2.0	0.3	0.3537	0.4583	0.6778	0.6778	1.2676
33	0.254	3.931	3.0	0.4	0.2132	0.1462	0.3169	0.3169	0.5926
34	0.262	3.814	0.	0.	0.	0.	0.	0.	0.
35	0.270	3.703	0.	0.	0.	0.	0.	0.	0.
36	0.278	3.599	0.	0.	0.	0.	0.	0.	0.
37	0.286	3.501	0.	0.	0.	0.	0.	0.	0.
38	0.293	3.408	0.	0.	0.	0.	0.	0.	0.
39	0.301	3.319	0.	0.	0.	0.	0.	0.	0.
40	0.309	3.235	0.	0.	0.	0.	0.	0.	0.
41	0.317	3.156	0.	0.	0.	0.	0.	0.	0.
42	0.325	3.080	0.	0.	0.	0.	0.	0.	0.
43	0.333	3.007	0.	0.	0.	0.	0.	0.	0.
44	0.340	2.938	0.	0.	0.	0.	0.	0.	0.
45	0.348	2.872	0.	0.	0.	0.	0.	0.	0.
46	0.355	2.809	0.	0.	0.	0.	0.	0.	0.

(Continued)

(Sheet 1 of 6)

#### PART IV: CONCLUSIONS

10. Evaluation of the data presented herein led to the following conclusions.

11. Significant wave heights in Lake Michigan during the period of observation ranged from less than 1.0 ft to a maximum of 8.8 ft. Significant wave heights in Ludington Harbor Channel ranged from less than 1.0 ft to a maximum of 1.3 ft. The greatest peak period observed in Lake Michigan during the period of observation was 8.8 sec; the greatest peak period observed in the Ludington Harbor Channel ranged from about 6.2 sec to about 6.5 sec.\*

12. Inspection of peak periods occurring simultaneously in the lake and harbor channel indicate a very close relationship between the periods up to a maximum of about 6 sec. During times when the peak period in Lake Michigan exceeds 6 sec, the period in the harbor channel is still about 6 sec. It appears the geometrical configuration of Ludington Harbor does not permit waves of periods greater than about 6 sec irrespective of the periods of the waves entering the harbor from Lake Michigan.

13. Comparison of the wind and wave records indicates that periods of greatest wave activity in the harbor channel coincide with periods when the winds are from almost due west. It is during these periods that the peak of the wave spectra obtained in the harbor channel closely match the peak of the spectra obtained in Lake Michigan; thus it is reasonable to assume that the waves observed in the channel are propagating in from Lake Michigan. However, when the wind is from directions other than very close to due west, there is almost no wave activity observed in the harbor channel even though the significant wave height in Lake Michigan just outside the harbor exceeds 4 ft. Conversely, when the wind is from almost due west, the significant wave height in the harbor channel approaches the observed maximum of 1.3 ft even though the significant wave height in Lake Michigan at the time is only about 2 ft.

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\* The periods of 227.556 shown in Tables 2, 3, and 4 are a consequence of spectrally analyzing wave records obtained during calm conditions and are ignored for the purpose of this discussion.

Table 2 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	SIG. PER. (SEC.)	SIG. HT. (FT.)	BAD POINTS	RECORD NUMBER	JULIAN DATE	TIME	SIG. PER. (SEC.)	SIG. HT. (FT.)	BAD POINTS
437	179	1230	227.556	0.059	0	399	179	430	227.556	0.258	0
438	179	1430	227.556	0.066	0	400	179	630	227.556	0.226	0
439	179	1630	227.556	0.059	0	401	179	830	227.556	0.368	0
440	179	1830	227.556	0.062	0	402	179	1030	227.556	0.263	0
441	179	2030	227.556	0.079	0	403	179	1230	227.556	0.234	0
442	179	2230	227.556	0.079	0	404	179	1430	227.556	0.261	0
443	180	0030	227.556	0.145	0	405	179	1630	227.556	0.333	0
444	180	0230	227.556	0.156	0	406	179	1830	227.556	0.334	0
445	180	0430	227.556	0.213	0	407	179	2030	227.556	0.448	0
446	180	0630	227.556	0.094	0	408	179	2230	227.556	0.370	0
447	180	0830	227.556	0.069	0	409	180	0030	227.556	0.311	1
448	180	1030	227.556	0.051	0	410	180	0230	227.556	0.320	0
449	180	1230	227.556	0.071	0	411	180	0430	227.556	0.429	0
450	180	1430	227.556	0.164	0	412	180	0630	227.556	0.321	0
451	180	1630	227.556	0.080	0	413	180	0830	227.556	0.363	0
452	180	1830	227.556	0.150	0	414	180	1030	227.556	0.248	0
453	180	2030	227.556	0.237	0	415	180	1230	227.556	0.211	0
454	180	2230	227.556	0.254	0	416	180	1430	227.556	0.251	0
455	181	0030	227.556	0.129	0	417	180	1630	227.556	0.237	0
456	181	0230	227.556	0.097	0	418	180	1830	227.556	0.314	0
457	181	0430	227.556	0.116	0	419	180	2030	227.556	0.351	0
458	181	0630	227.556	0.082	0	420	180	2230	227.556	0.481	0
459	181	0830	227.556	0.141	0	421	181	0030	227.556	0.400	0
460	181	1030	227.556	0.067	0	422	181	0230	227.556	0.342	0
461	181	1230	227.556	0.133	0	423	181	0430	227.556	0.426	0
462	181	1430	227.556	0.214	0	424	181	0630	227.556	0.416	0
463	181	1630	227.556	0.243	0	425	181	0830	227.556	0.405	0
464	181	1830	227.556	0.155	0	426	181	1030	227.556	0.371	0
465	181	2030	227.556	0.156	0	427	181	1230	227.556	0.454	0
466	181	2230	227.556	0.216	0	428	181	1430	227.556	0.405	0
467	182	0030	227.556	0.163	0	429	181	1630	227.556	0.381	0
468	182	0230	227.556	0.147	0	430	181	1830	227.556	0.330	0
469	182	0430	227.556	0.165	0	431	181	2030	227.556	0.419	0
470	182	0630	227.556	0.365	0	432	181	2230	227.556	0.481	0
471	182	0830	227.556	0.282	0	433	182	0030	227.556	0.481	0
472	182	1030	227.556	0.448	0	434	182	0230	227.556	0.481	0
473	182	1230	227.556	0.586	0	435	182	0430	227.556	0.481	0
474	182	1430	227.556	0.256	0	436	182	0630	227.556	0.481	0
475	182	1630	227.556	0.283	0	437	182	0830	227.556	0.481	0
476	182	1830	227.556	0.391	0	438	182	1030	227.556	0.481	0
477	182	2030	227.556	0.255	0	439	182	1230	227.556	0.481	0
478	182	2230	227.556	0.618	0	440	182	1430	227.556	0.481	0
479	183	0030	227.556	0.618	0	441	182	1630	227.556	0.481	0
480	183	0230	227.556	0.444	0	442	182	1830	227.556	0.481	0
481	183	0430	227.556	0.695	0	443	182	2030	227.556	0.481	0
482	183	0630	227.556	0.213	0	444	182	2230	227.556	0.481	0
483	183	0830	227.556	0.713	0	445	183	0030	227.556	0.481	0
484	183	1030	227.556	0.153	0	446	183	0230	227.556	0.481	0
485	183	1230	227.556	0.328	0	447	183	0430	227.556	0.481	0
486	183	1430	227.556	0.714	0	448	183	0630	227.556	0.481	0
487	183	1630	227.556	0.119	0	449	183	0830	227.556	0.481	0
488	183	1830	227.556	0.119	0	450	183	1030	227.556	0.481	0
489	183	2030	227.556	0.282	0	451	183	1230	227.556	0.481	0
490	183	2230	227.556	1.043	0	452	183	1430	227.556	0.481	0
491	184	0030	227.556	0.608	0	453	183	1630	227.556	0.481	0
492	184	0230	227.556	0.213	0	454	183	1830	227.556	0.481	0
493	184	0430	227.556	0.287	0	455	183	2030	227.556	0.481	0
494	184	0630	227.556	0.103	0	456	183	2230	227.556	0.481	0
495	184	0830	227.556	0.137	0	457	184	0030	227.556	0.481	0

(Continued)

Table 2 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)
453	184	1030	0	227.556	0.496	458	184	230	7	3.703	0.558
459	184	1230	0	5.007	0.206	459	184	430	0	3.814	0.530
460	184	1430	0	5.211	0.239	460	184	450	4	3.703	2.063
461	184	1630	0	227.556	0.232	461	184	830	5	3.814	2.515
462	184	1830	0	227.556	0.209	462	184	1030	0	4.481	2.982
463	184	2030	0	227.556	0.219	463	184	1230	9	4.519	3.082
464	184	2230	0	227.556	0.4	464	184	1430	2	5.211	3.031
465	185	30	0	227.556	0.325	465	184	1630	10	4.819	2.854
466	185	230	0	227.556	0.611	466	184	1830	12	3.931	2.771
467	185	430	0	227.556	0.864	467	184	2030	0	4.644	2.834
468	185	630	0	227.556	0.338	468	184	2230	0	4.007	3.710
469	185	830	0	227.556	0.379	469	185	30	14	3.936	3.916
470	185	1030	0	227.556	0.402	470	185	230	13	5.936	4.117
471	185	1230	0	227.556	0.269	471	185	430	0	5.936	2.929
472	185	1430	0	227.556	0.261	472	185	630	16	5.936	3.159
473	185	1630	0	227.556	0.340	473	185	830	15	3.703	3.355
474	185	1830	0	227.556	0.402	474	185	1030	17	4.055	3.024
475	185	2030	0	227.556	0.275	475	185	1230	0	3.703	3.295
476	185	2230	0	227.556	0.555	476	185	1430	18	5.936	2.158
477	186	30	0	227.556	0.350	477	185	1630	0	5.936	1.830
478	186	230	0	3.931	0.317	478	185	1830	19	5.211	1.537
479	186	430	0	4.188	0.485	479	185	2030	21	0	0
480	186	630	0	227.556	0.309	480	185	2230	0	4.644	1.230
481	186	830	24	0	0	481	186	30	23	0	0
482	186	1030	0	227.556	0.121	482	186	230	24	0	0
483	186	1230	0	227.556	0.224	483	186	430	0	4.188	2.144
484	186	1430	0	227.556	0.135	484	186	630	0	0	0
485	186	1630	0	227.556	0.191	485	186	830	22	0	0
486	186	1830	0	227.556	0.102	486	186	1030	0	3.703	1.144
487	186	2030	0	227.556	0.256	487	186	1230	22	0	0
488	186	2230	0	227.556	0.122	488	186	1430	23	0	0
489	187	30	0	227.556	0.133	489	186	1630	0	6.543	1.048
490	187	230	0	227.556	0.092	490	186	1830	20	3.703	2.128
491	187	430	0	227.556	0.095	491	186	2030	20	3.703	3.261
492	187	630	0	227.556	0.054	492	186	2230	0	3.703	0.456
493	187	830	0	227.556	0.150	493	187	30	8	3.814	2.681
494	187	1030	0	227.556	0.070	494	187	230	4	3.703	0.410
495	187	1230	0	227.556	0.057	495	187	430	0	227.556	0.269
496	187	1430	0	227.556	0.063	496	187	630	4	227.556	0.219
497	187	1630	0	227.556	0.132	497	187	830	4	3.703	0.764
498	187	1830	0	227.556	0.065	498	187	1030	5	6.225	0.249
499	187	2030	0	227.556	0.143	499	187	1230	5	4.481	0.217
500	187	2230	0	227.556	0.187	500	187	1430	4	3.703	0.719
501	188	30	0	227.556	0.172	501	187	1630	0	227.556	0.190
502	188	230	0	227.556	0.202	502	187	1830	3	3.814	0.344
503	188	430	0	227.556	0.085	503	187	2030	0	4.819	0.269
504	188	630	0	227.556	0.161	504	187	2230	0	227.556	0.318
505	188	830	0	227.556	0.139	505	188	30	2	5.007	0.247
506	188	1030	0	227.556	0.188	506	188	230	2	227.556	0.244
507	188	1230	0	227.556	0.282	507	188	430	0	227.556	0.244
508	188	1430	0	227.556	0.259	508	188	630	4	227.556	0.194
509	188	1630	0	227.556	0.136	509	188	830	7	3.703	0.279
510	188	1830	0	227.556	0.139	510	188	1030	0	3.703	0.478
511	188	2030	0	227.556	0.430	511	188	1230	0	3.703	0.679
512	188	2230	0	227.556	0.437	512	188	1430	0	3.703	0.696
513	189	30	0	227.556	0.137	513	188	1630	0	3.703	0.974
514	189	230	0	227.556	0.163	514	188	1830	8	3.911	1.508
515	189	430	0	227.556	0.109	515	188	2030	11	3.703	1.234
516	189	630	0	4.530	0.143	516	188	2230	0	4.310	1.438

(Continued)

(Sheet 9 of 13)

Table 2 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	SIG. PER. (SEC.)	SIG. HT. (FT.)	BAD POINTS	RECORD NUMBER	JULIAN DATE	TIME	SIG. PER. (SEC.)	SIG. HT. (FT.)	BAD POINTS	RECORD NUMBER	JULIAN DATE	TIME	SIG. PER. (SEC.)	SIG. HT. (FT.)
517	189	830	227.556	0.153	0	517	189	30	4.188	1.134	11	517	189	30	4.188	1.134
518	189	1030	227.556	0.200	0	518	189	230	4.055	1.268	10	518	189	230	4.055	1.268
519	189	1230	227.556	0.265	0	519	189	430	4.055	1.078	0	519	189	430	4.055	1.078
520	189	1430	227.556	0.264	0	520	189	630	4.188	1.354	9	520	189	630	4.188	1.354
521	189	1630	4.044	0.243	0	521	189	830	4.481	1.205	11	521	189	830	4.481	1.205
522	189	1830	4.044	0.235	0	522	189	1030	3.931	1.508	0	522	189	1030	3.931	1.508
523	189	2030	227.556	0.260	0	523	189	1230	4.055	1.443	10	523	189	1230	4.055	1.443
524	189	2230	4.819	0.176	0	524	189	1430	4.055	2.175	0	524	189	1430	4.055	2.175
525	190	30	4.819	0.121	0	525	190	1630	4.481	2.231	10	525	190	1630	4.481	2.231
526	190	230	4.044	0.102	0	526	190	1830	3.931	2.282	0	526	190	1830	3.931	2.282
527	190	430	227.556	0.124	0	527	190	2030	4.481	2.282	10	527	190	2030	4.481	2.282
528	190	630	227.556	0.084	0	528	190	2230	3.931	2.289	9	528	190	2230	3.931	2.289
529	190	830	227.556	0.069	0	529	190	30	4.330	2.008	0	529	190	30	4.330	2.008
530	190	1030	227.556	0.075	0	530	190	50	4.188	1.433	17	530	190	50	4.188	1.433
531	190	1230	227.556	0.110	0	531	190	230	4.481	1.338	11	531	190	230	4.481	1.338
532	190	1430	227.556	0.129	0	532	190	430	4.055	0.833	0	532	190	430	4.055	0.833
533	190	1630	227.556	0.123	0	533	190	630	4.330	2.566	18	533	190	630	4.330	2.566
534	190	1830	227.556	0.065	0	534	190	830	3.703	0.419	11	534	190	830	3.703	0.419
535	190	2030	227.556	0.109	0	535	190	1030	3.703	1.072	18	535	190	1030	3.703	1.072
536	190	2230	227.556	0.311	0	536	190	1230	227.556	0.271	19	536	190	1230	227.556	0.271
537	191	30	227.556	0.080	0	537	191	1430	3.814	0.158	0	537	191	1430	3.814	0.158
538	191	230	227.556	0.046	0	538	191	1630	227.556	0.213	18	538	191	1630	227.556	0.213
539	191	430	227.556	0.063	0	539	191	1830	3.703	0.219	19	539	191	1830	3.703	0.219
540	191	630	227.556	0.071	0	540	191	2030	3.703	0.261	0	540	191	2030	3.703	0.261
541	191	830	227.556	0.034	0	541	191	2230	227.556	0.274	17	541	191	2230	227.556	0.274
542	191	1030	227.556	0.081	0	542	191	30	3.703	0.344	17	542	191	30	3.703	0.344
543	191	1230	227.556	0.067	0	543	191	230	227.556	0.293	16	543	191	230	227.556	0.293
544	191	1430	227.556	0.114	0	544	191	430	3.814	0.262	16	544	191	430	3.814	0.262
545	191	1630	227.556	0.059	14	545	191	630	227.556	0.192	0	545	191	630	227.556	0.192
546	191	1830	227.556	0.087	0	546	191	830	227.556	0.207	16	546	191	830	227.556	0.207
547	191	2030	227.556	0.199	0	547	191	1030	227.556	0.182	19	547	191	1030	227.556	0.182
548	191	2230	227.556	0.078	0	548	191	1230	227.556	0.498	15	548	191	1230	227.556	0.498
549	191	30	227.556	0.181	0	549	191	1430	227.556	0.265	20	549	191	1430	227.556	0.265
550	192	230	227.556	0.071	0	550	192	1630	227.556	0.239	19	550	192	1630	227.556	0.239
551	192	430	227.556	0.162	0	551	192	1830	3.703	0.922	19	551	192	1830	3.703	0.922
552	192	630	227.556	0.098	0	552	192	2030	4.819	0.142	8	552	192	2030	4.819	0.142
553	192	830	227.556	0.217	0	553	192	2230	0	0	21	553	192	2230	0	0
554	192	1030	227.556	0.104	0	554	192	30	0	0	22	554	192	30	0	0
555	192	1230	227.556	0.110	0	555	192	230	227.556	0.101	0	555	192	230	227.556	0.101
556	192	1430	227.556	0.205	0	556	192	430	3.703	2.085	18	556	192	430	3.703	2.085
557	192	1630	227.556	0.130	0	557	192	630	0	0	27	557	192	630	0	0
558	192	1830	227.556	0.192	0	558	192	830	3.814	0.221	0	558	192	830	3.814	0.221
559	192	2030	227.556	0.119	0	559	192	1030	0	0	34	559	192	1030	0	0
560	192	2230	227.556	0.228	0	560	192	1230	0	0	34	560	192	1230	0	0
561	193	30	227.556	0.108	0	561	193	1430	3.703	0.445	0	561	193	1430	3.703	0.445
562	193	230	227.556	0.091	0	562	193	1630	0	0	40	562	193	1630	0	0
563	193	430	227.556	0.088	0	563	193	1830	0	0	43	563	193	1830	0	0
564	193	630	227.556	0.073	0	564	193	2030	3.703	1.280	0	564	193	2030	3.703	1.280
565	193	830	227.556	0.134	0	565	193	2230	0	0	40	565	193	2230	0	0
566	193	1030	227.556	0.126	0	566	193	30	0	0	56	566	193	30	0	0
567	193	1230	227.556	0.036	0	567	193	230	3.703	0.812	56	567	193	230	3.703	0.812
568	193	1430	227.556	0.092	0	568	193	430	0	0	41	568	193	430	0	0
569	193	1630	227.556	0.104	0	569	193	630	0	0	38	569	193	630	0	0
570	193	1830	227.556	0.042	0	570	193	830	3.814	0.412	0	570	193	830	3.814	0.412
571	193	2030	227.556	0.105	0	571	193	1030	0	0	35	571	193	1030	0	0
572	193	2230	227.556	0.121	0	572	193	1230	0	0	39	572	193	1230	0	0
573	194	30	227.556	0.075	0	573	194	1430	4.188	0.221	0	573	194	1430	4.188	0.221
574	194	230	227.556	0.096	0	574	194	1630	0	0	37	574	194	1630	0	0
575	194	430	227.556	0.103	0	575	194	1830	0	0	39	575	194	1830	0	0

(Continued)

Table 2 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)
576	194	410	0	227.556	0.108	576	193	2230	0	227.556	0.139
577	194	430	0	227.556	0.097	577	194	30	39	0.	0.
578	194	1710	0	227.556	0.122	578	194	230	38	0.	0.
579	194	1710	0	227.556	0.072	579	194	430	0	227.556	0.061
580	194	1710	0	227.556	0.041	580	194	630	0	0.	0.
581	194	1710	0	227.556	0.066	581	194	830	40	0.	0.
582	194	1830	0	227.556	0.071	582	194	1030	0	227.556	0.167
583	194	2030	0	227.556	0.132	583	194	1230	38	0.	0.
584	194	2230	0	227.556	0.086	584	194	1430	35	0.	0.
585	194	2430	0	227.556	0.087	585	194	1630	0	227.556	0.117
586	194	2630	0	227.556	0.076	586	194	1830	38	0.	0.
587	194	2830	0	227.556	0.104	587	194	2030	50	0.	0.
588	194	3030	0	227.556	0.135	588	194	2230	7	4.819	0.155
589	194	3230	0	227.556	0.100	589	194	2430	44	0.	0.
590	194	3430	0	227.556	0.123	590	194	2630	43	0.	0.
591	194	3630	0	227.556	0.055	591	194	2830	0	227.556	0.071
592	194	3830	0	227.556	0.045	592	194	3030	49	0.	0.
593	194	4030	0	227.556	0.050	593	194	3230	61	0.	0.
594	194	4230	0	227.556	0.120	594	194	3430	0	3.703	0.323
595	194	4430	0	227.556	0.096	595	194	3630	50	0.	0.
596	194	4630	0	227.556	0.057	596	194	3830	54	0.	0.
597	194	4830	0	227.556	0.110	597	194	4030	11	3.931	1.837
598	194	5030	0	227.556	0.036	598	194	4230	7	0.	0.
599	194	5230	0	227.556	0.027	599	194	4430	2	0.	0.
600	194	5430	0	227.556	0.070	600	194	4630	5	0.	0.
601	194	5630	0	227.556	0.080	601	194	4830	9	0.	0.
602	194	5830	0	227.556	0.049	602	194	5030	7	0.	0.
603	194	6030	0	227.556	0.024	603	194	5230	4	0.	0.
604	194	6230	21	0.	0.	604	194	5430	13	0.	0.
605	194	6430	0	227.556	0.100	605	194	5630	10	0.	0.
606	194	6630	0	227.556	0.140	606	194	5830	7	0.	0.
607	194	6830	0	227.556	0.042	607	194	6030	4	0.	0.
608	194	7030	0	227.556	0.125	608	194	6230	17	0.	0.
609	194	7230	0	227.556	0.035	609	194	6430	1	0.	0.
610	194	7430	0	227.556	0.066	610	194	6630	3	0.	0.
611	194	7630	0	227.556	0.020	611	194	6830	10	0.	0.
612	194	7830	0	227.556	0.049	612	194	7030	6	0.	0.
613	194	8030	0	227.556	0.114	613	194	7230	10	0.	0.
614	194	8230	0	227.556	0.067	614	194	7430	5	0.	0.
615	194	8430	0	227.556	0.117	615	194	7630	4	0.	0.
616	194	8630	0	227.556	0.169	616	194	7830	6	0.	0.
617	194	8830	0	227.556	0.102	617	194	8030	8	0.	0.
618	194	9030	0	227.556	0.038	618	194	8230	11	0.	0.
619	194	9230	0	227.556	0.056	619	194	8430	3	0.	0.
620	194	9430	0	227.556	0.104	620	194	8630	6	0.	0.
621	194	9630	0	227.556	0.034	621	194	8830	2	0.	0.
622	194	9830	0	227.556	0.054	622	194	9030	7	0.	0.
623	194	10030	0	227.556	0.168	623	194	9230	9	0.	0.
624	194	10230	0	227.556	0.122	624	194	9430	9	0.	0.
625	194	10430	0	227.556	0.097	625	194	9630	10	0.	0.
626	194	10630	4	227.556	0.244	626	194	9830	2	0.	0.
627	194	10830	0	227.556	0.100	627	194	10030	5	0.	0.
628	194	11030	0	227.556	0.150	628	194	10230	4	0.	0.
629	194	11230	0	227.556	0.170	629	194	10430	8	0.	0.
630	194	11430	0	227.556	0.057	630	194	10630	7	0.	0.
631	194	11630	0	227.556	0.057	631	194	10830	7	0.	0.
632	194	11830	0	227.556	0.057	632	194	11030	7	0.	0.
633	194	12030	0	227.556	0.057	633	194	11230	7	0.	0.
634	194	12230	0	227.556	0.057	634	194	11430	7	0.	0.

(Continued)



Table 2 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)
615	198	457	0	227.556	0.149	615	198	2030	7	0.	0.
616	199	630	0	227.556	0.169	616	198	2230	9	0.	0.
617	199	410	0	227.556	0.210	617	199	30	5	0.	0.
618	199	1030	0	227.556	0.267	618	199	230	11	0.	0.
619	199	1230	0	227.556	0.241	619	199	430	14	0.	0.
620	199	1430	0	227.556	0.135	620	199	430	11	0.	0.
621	199	1630	5	227.556	0.223	621	199	830	13	0.	0.
622	199	1830	0	227.556	0.346	622	199	1030	16	0.	0.
623	199	2030	0	227.556	0.138	623	199	1230	4	0.	0.
624	199	2230	0	227.556	0.147	624	199	1430	44	0.	0.493
625	200	30	0	227.556	0.097	625	199	1630	8	3.931	0.
626	200	210	0	227.556	0.181	626	199	1830	11	0.	0.
627	200	430	0	227.556	0.343	627	199	2030	29	0.	0.
628	200	630	0	227.556	0.137	628	199	2230	22	0.	0.
629	200	830	0	227.556	0.039	629	200	30	12	0.	0.
630	200	1030	0	227.556	0.057	630	200	230	24	0.	0.
631	200	1230	0	227.556	0.064	631	200	430	27	0.	0.
632	200	1430	0	227.556	0.072	632	200	630	47	0.	0.
633	200	1630	256	0.	0.	633	200	830	38	0.	0.
634	200	1830	790	0.	0.	634	200	1030	0	227.556	0.139
635	200	2030	0	227.556	0.113	635	200	1230	3	227.556	0.102
636	201	30	0	227.556	0.171	636	200	1430	13	227.556	0.082
637	201	210	0	227.556	0.376	637	200	1630	0	227.556	0.254
638	201	430	0	227.556	0.801	638	200	1830	15	227.556	0.229
639	201	630	0	227.556	0.417	639	200	2030	0	227.556	0.098
640	201	830	0	227.556	0.780	640	200	2230	0	227.556	0.282
641	201	1030	0	227.556	0.425	641	201	30	0	227.556	0.702
642	201	1230	0	227.556	0.364	642	201	230	0	227.556	0.783
643	201	1430	0	227.556	0.260	643	201	430	0	227.556	0.573
644	201	1630	0	227.556	0.164	644	201	630	12	3.814	2.316
645	201	1830	0	227.556	0.138	645	201	830	35	0.	0.
646	201	2030	0	227.556	0.153	646	201	1030	0	227.556	1.461
647	201	2230	0	227.556	0.163	647	201	1230	0	227.556	0.898
648	201	30	0	227.556	0.163	648	201	1430	0	227.556	1.173
649	201	430	0	227.556	0.302	649	201	1630	0	4.188	1.218
650	202	230	0	227.556	0.112	650	201	1830	0	4.330	0.977
651	202	430	0	227.556	0.084	651	201	2030	16	4.055	0.702
652	202	630	0	227.556	0.346	652	201	2230	0	227.556	0.733
653	202	830	0	227.556	0.295	653	202	30	23	0.	0.
654	202	1030	0	227.556	0.295	654	202	230	9	3.931	0.409
655	202	1230	0	227.556	0.496	655	202	430	0	227.556	0.442
656	202	1430	0	227.556	0.379	656	202	630	18	3.703	2.481
657	202	1630	0	227.556	0.464	657	202	830	14	227.556	0.523
658	202	1830	0	227.556	0.441	658	202	1030	0	227.556	0.487
659	202	2030	0	227.556	0.155	659	202	1230	31	0.	0.
660	202	2230	0	227.556	0.133	660	202	1430	42	0.	0.
661	203	30	0	227.556	0.133	661	202	1630	0	227.556	0.359
662	203	230	0	227.556	0.301	662	202	1830	27	0.	0.
663	203	430	0	227.556	0.133	663	202	2030	39	0.	0.
664	203	630	0	227.556	0.268	664	202	2230	0	227.556	0.321
665	203	830	0	227.556	0.091	665	203	30	5	227.556	0.442
666	203	1030	0	227.556	0.236	666	203	230	0	227.556	0.349
667	203	1230	0	227.556	0.120	667	203	430	0	227.556	0.569
668	203	1430	0	227.556	0.473	668	203	630	34	0.	0.
669	203	1630	0	227.556	0.256	669	203	830	26	0.	0.
670	203	1830	0	227.556	0.731	670	203	1030	0	227.556	0.406
671	203	2030	0	227.556	0.476	671	203	1230	27	0.	0.
672	203	2230	0	227.556	0.278	672	203	1430	35	0.	0.
673	204	30	0	227.556	0.115	673	203	1630	0	4.819	0.484

(Continued)

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Table 2 (Concluded)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)
694	204	211	0	227.556	0.364	674	203	1830	31	0.	0.
695	204	430	0	227.556	0.202	695	203	2030	53	0.	0.
696	204	630	0	227.556	0.272	696	203	2230	35	0.	0.
697	204	830	0	227.556	0.069	697	204	30	22	0.	0.
698	204	1030	0	227.556	0.118	698	204	230	39	0.	0.
699	204	1230	0	227.556	0.176	699	204	430	0	227.556	0.297
700	204	1430	0	227.556	0.038	700	204	630	0	227.556	0.295
701	204	1630	0	227.556	0.124	701	204	830	9	227.556	0.541
702	204	1830	0	227.556	0.084	702	204	1030	0	227.556	0.507
703	204	2030	0	227.556	0.294	703	204	1230	30	0.	0.
704	204	2230	0	227.556	0.116	704	204	1430	54	0.	0.
705	205	30	0	227.556	0.149	705	204	1630	15	0.	0.
706	205	210	0	227.556	0.434	706	204	1830	9	0.	0.
707	205	430	0	227.556	0.385	707	204	2030	7	0.	0.
708	205	630	0	227.556	0.132	708	204	2230	7	0.	0.
709	205	830	0	227.556	0.155	709	205	30	14	0.	0.
710	205	1030	0	227.556	0.216	710	205	230	0	0.	0.
711	205	1230	0	227.556	0.064	711	205	430	5	0.	0.
712	205	1430	0	227.556	0.096	712	205	630	1	0.	0.
713	205	1630	0	227.556	0.110	713	205	830	0	0.	0.
714	205	1830	9	227.556	0.200	714	205	1030	1	5.931	0.740
715	205	2030	0	227.556	0.116	715	205	1230	24	0.	0.
716	205	2230	16	227.556	0.167	716	205	1430	0	5.931	0.548
717	206	30	0	227.556	0.137	717	205	1630	0	3.703	0.689
718	206	210	0	227.556	0.120	718	205	1830	2	3.931	0.941
719	206	430	0	227.556	0.198	719	205	2030	0	4.644	0.955
720	206	630	0	227.556	0.046	720	205	2230	0	5.931	0.605
721	206	830	0	227.556	0.112	721	206	30	0	3.931	0.252
722	206	1030	0	227.556	0.069	722	206	230	0	3.703	0.179
723	206	1230	0	227.556	0.032	723	206	430	0	4.481	0.277
724	206	1430	0	227.556	0.132	724	206	630	0	227.556	0.309
725	206	1630	0	227.556	0.112	725	206	830	0	4.819	0.316
726	206	1830	0	227.556	0.100	726	206	1030	0	5.211	0.360
727	206	2030	14	227.556	0.188	727	206	1230	0	227.556	0.374
728	206	2230	1017	0.	0.	728	206	1430	0	4.055	0.386
729	206	30	0	227.556	0.069	729	206	1630	0	4.644	0.386
730	206	210	0	227.556	0.120	730	206	1830	0	5.211	0.315
731	206	430	0	227.556	0.198	731	206	2030	0	3.703	0.319
732	206	630	0	227.556	0.046	732	206	2230	0	5.931	0.353
733	207	30	0	227.556	0.112	733	207	30	0	227.556	0.209
734	207	230	0	227.556	0.069	734	207	430	0	227.556	0.169
735	207	430	0	227.556	0.137	735	207	630	0	227.556	0.197
736	207	630	0	227.556	0.120	736	207	830	0	5.432	0.179
737	207	830	0	227.556	0.069	737	207	1030	0	227.556	0.214
738	207	1030	0	227.556	0.120	738	207	1230	0	227.556	0.238
739	207	1230	0	227.556	0.069	739	207	1430	0	227.556	0.278
740	207	1430	0	227.556	0.154	740	207	1630	0	227.556	0.154
741	207	1630	0	227.556	0.181	741	207	1830	0	227.556	0.181
742	207	1830	0	227.556	0.205	742	207	2030	0	227.556	0.205
743	207	2030	0	227.556	0.334	743	207	2230	5	4.819	0.334
744	207	2230	0	227.556	0.214	744	207	30	5	5.007	0.214
745	208	30	0	227.556	0.293	745	208	230	0	5.432	0.293
746	208	230	0	227.556	0.262	746	208	430	531	5.211	0.262
747	208	430	0	227.556	0.	747	208	430	0	0.	0.

Table 3

## Wave Data Record Summary

## Ludington Harbor, Michigan

a. Gage 7; Ludington Harbor Channel  
11 August 1983 - 4 October 1983  
Data Recovery Rate: 99.1%

b. Gage 9; Lake Michigan Site  
11 August 1983 - 4 October 1983  
Data Recovery Rate: 29.7%

RECORD NUMBER	JULIAN DATE	TIME	LAD POINTS	SIG. PER. (SECS.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	LAD POINTS	SIG. PER. (SECS.)	SIG. HT. (FT.)
1	223	200	19	0.	0.	1	223	200	0	0.	0.
2	223	400	0	0.	0.	2	223	400	17	0.	0.
3	223	600	4	0.	0.	3	223	600	21	0.	0.
4	223	800	10	0.	0.	4	223	800	14	0.	0.
5	223	1000	0	227.556	0.287	5	223	1000	0	5.007	1.471
6	223	1200	0	227.556	0.254	6	223	1200	0	227.556	0.757
7	223	1400	0	227.556	0.209	7	223	1400	0	3.700	0.938
8	223	1600	0	227.556	0.070	8	223	1600	0	8.700	0.909
9	223	1800	0	227.556	0.128	9	223	1800	0	8.700	1.173
10	223	2000	0	227.556	0.099	10	223	2000	16	6.876	1.088
11	223	2200	0	227.556	0.122	11	223	2200	0	3.703	0.958
12	223	2400	0	227.556	0.113	12	223	2400	0	5.007	0.812
13	224	200	0	227.556	0.173	13	224	200	0	5.007	0.665
14	224	400	0	227.556	0.078	14	224	400	0	4.055	0.402
15	224	600	0	227.556	0.067	15	224	600	0	227.556	0.438
16	224	800	0	227.556	0.081	16	224	800	0	227.556	0.370
17	224	1000	0	227.556	0.079	17	224	1000	0	227.556	0.320
18	224	1200	0	227.556	0.077	18	224	1200	0	227.556	0.306
19	224	1400	0	227.556	0.074	19	224	1400	0	4.876	0.327
20	224	1600	0	227.556	0.172	20	224	1600	0	5.211	0.318
21	224	1800	0	227.556	0.201	21	224	1800	0	5.211	0.441
22	224	2000	0	227.556	0.067	22	224	2000	0	227.556	0.379
23	224	2200	0	227.556	0.112	23	224	2200	0	227.556	0.502
24	224	2400	0	227.556	0.135	24	224	2400	0	227.556	0.287
25	225	200	0	227.556	0.073	25	225	200	0	227.556	0.278
26	225	400	0	227.556	0.128	26	225	400	0	227.556	0.277
27	225	600	0	227.556	0.169	27	225	600	0	227.556	0.277
28	225	800	0	227.556	0.169	28	225	800	0	227.556	0.174
29	225	1000	0	227.556	0.160	29	225	1000	0	227.556	0.219
30	225	1200	0	227.556	0.087	30	225	1200	0	227.556	0.153
31	225	1400	0	227.556	0.090	31	225	1400	0	227.556	0.242
32	225	1600	0	227.556	0.114	32	225	1600	0	227.556	0.320
33	225	1800	0	227.556	0.079	33	225	1800	0	227.556	0.215
34	225	2000	0	227.556	0.138	34	225	2000	0	4.188	0.195
35	225	2200	0	227.556	0.063	35	225	2200	0	4.188	0.261
36	225	2400	0	227.556	0.075	36	225	2400	0	4.481	0.283
37	226	200	0	227.556	0.076	37	226	200	0	5.211	0.421
38	226	400	0	227.556	0.070	38	226	400	0	5.211	0.226
39	226	600	0	227.556	0.058	39	226	600	0	3.814	0.400
40	226	800	0	227.556	0.081	40	226	800	0	3.814	0.539
41	226	1000	0	227.556	0.082	41	226	1000	0	3.703	0.391
42	226	1200	0	227.556	0.081	42	226	1200	0	3.703	0.388
43	226	1400	0	227.556	0.039	43	226	1400	0	3.814	0.380
44	226	1600	0	227.556	0.066	44	226	1600	0	5.703	0.532

(Continued)

(Sheet 1 of 12)

Table 3 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)
45	226	1800	0	227.556	0.206	45	226	1800	0	227.556	0.206
46	226	2000	0	227.556	0.100	46	226	2000	0	227.556	0.100
47	226	2200	0	227.556	0.094	47	226	2200	0	227.556	0.094
48	226	2400	0	227.556	0.072	48	226	2400	0	227.556	0.072
49	227	0000	0	227.556	0.061	49	227	0000	0	227.556	0.061
50	227	0200	0	227.556	0.071	50	227	0200	0	227.556	0.071
51	227	0400	0	227.556	0.098	51	227	0400	0	227.556	0.098
52	227	0600	0	227.556	0.037	52	227	0600	0	227.556	0.037
53	227	0800	0	227.556	0.089	53	227	0800	0	227.556	0.089
54	227	1000	0	227.556	0.071	54	227	1000	0	227.556	0.071
55	227	1200	0	227.556	0.077	55	227	1200	0	227.556	0.077
56	227	1400	0	227.556	0.060	56	227	1400	0	227.556	0.060
57	227	1600	0	227.556	0.078	57	227	1600	0	227.556	0.078
58	227	1800	0	227.556	0.056	58	227	1800	0	227.556	0.056
59	227	2000	0	227.556	0.056	59	227	2000	0	227.556	0.056
60	227	2200	0	227.556	0.109	60	227	2200	0	227.556	0.109
61	227	2400	0	227.556	0.116	61	227	2400	0	227.556	0.116
62	228	0000	0	227.556	0.102	62	228	0000	0	227.556	0.102
63	228	0200	0	227.556	0.091	63	228	0200	0	227.556	0.091
64	228	0400	0	227.556	0.243	64	228	0400	0	227.556	0.243
65	228	0600	0	227.556	0.070	65	228	0600	0	227.556	0.070
66	228	0800	0	227.556	0.137	66	228	0800	0	227.556	0.137
67	228	1000	0	227.556	0.095	67	228	1000	0	227.556	0.095
68	228	1200	0	227.556	0.093	68	228	1200	0	227.556	0.093
69	228	1400	0	227.556	0.066	69	228	1400	0	227.556	0.066
70	228	1600	0	227.556	0.046	70	228	1600	0	227.556	0.046
71	228	1800	0	227.556	0.080	71	228	1800	0	227.556	0.080
72	228	2000	0	227.556	0.240	72	228	2000	0	227.556	0.240
73	228	2200	0	227.556	0.113	73	228	2200	0	227.556	0.113
74	229	0000	0	227.556	0.127	74	229	0000	0	227.556	0.127
75	229	0200	0	227.556	0.140	75	229	0200	0	227.556	0.140
76	229	0400	0	227.556	0.202	76	229	0400	0	227.556	0.202
77	229	0600	0	227.556	0.658	77	229	0600	0	227.556	0.658
78	229	0800	0	227.556	0.598	78	229	0800	0	227.556	0.598
79	229	1000	0	227.556	0.592	79	229	1000	0	227.556	0.592
80	229	1200	0	227.556	0.561	80	229	1200	0	227.556	0.561
81	229	1400	0	227.556	0.250	81	229	1400	0	227.556	0.250
82	229	1600	0	227.556	0.206	82	229	1600	0	227.556	0.206
83	229	1800	0	227.556	0.379	83	229	1800	0	227.556	0.379
84	229	2000	0	227.556	0.135	84	229	2000	0	227.556	0.135
85	229	2200	0	227.556	0.171	85	229	2200	0	227.556	0.171
86	230	0000	0	227.556	0.281	86	230	0000	0	227.556	0.281
87	230	0200	0	227.556	0.218	87	230	0200	0	227.556	0.218
88	230	0400	0	227.556	0.516	88	230	0400	0	227.556	0.516
89	230	0600	0	227.556	0.567	89	230	0600	0	227.556	0.567
90	230	0800	0	227.556	0.076	90	230	0800	0	227.556	0.076
91	230	1000	0	227.556	0.162	91	230	1000	0	227.556	0.162
92	230	1200	0	227.556	0.178	92	230	1200	0	227.556	0.178
93	230	1400	0	227.556	0.333	93	230	1400	0	227.556	0.333
94	230	1600	0	227.556	0.091	94	230	1600	0	227.556	0.091
95	230	1800	0	227.556	0.072	95	230	1800	0	227.556	0.072
96	230	2000	0	227.556	0.283	96	230	2000	0	227.556	0.283
97	231	0000	0	227.556	0.062	97	231	0000	0	227.556	0.062
98	231	0200	0	227.556	0.068	98	231	0200	0	227.556	0.068
99	231	0400	0	227.556	0.232	99	231	0400	0	227.556	0.232
100	231	0600	0	227.556	0.099	100	231	0600	0	227.556	0.099
101	231	0800	0	227.556	0.162	101	231	0800	0	227.556	0.162
102	231	1000	0	227.556	0.178	102	231	1000	0	227.556	0.178
103	231	1200	0	227.556	0.189	103	231	1200	0	227.556	0.189

(Continued)

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Table 3 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)
174	231	1411	0	227.556	0.227	104	231	1600	19	0.	0.
175	231	1800	0	227.556	0.245	105	231	1800	5	0.	0.
176	231	2000	0	227.556	0.129	106	231	2000	6	0.	0.
177	231	2200	0	227.556	0.103	107	231	2200	5	0.	0.
178	231	2400	0	227.556	0.129	108	231	2400	0	0.	0.
179	232	2100	0	227.556	0.261	109	232	2100	5	0.	0.
180	232	2300	0	227.556	0.055	110	232	2300	5	0.	0.
181	232	2500	0	227.556	0.174	111	232	2500	0	0.	0.
182	232	2700	0	227.556	0.174	112	232	2700	0	0.	0.
183	232	2900	0	227.556	0.225	113	232	2900	4	0.	0.
184	232	3100	0	227.556	0.109	114	232	3100	4	0.	0.
185	232	3300	0	227.556	0.246	115	232	3300	1	0.	0.
186	232	3500	0	227.556	0.042	116	232	3500	3	0.	0.
187	232	3700	0	227.556	0.083	117	232	3700	6	0.	0.
188	232	3900	0	227.556	0.145	118	232	3900	0	0.	0.
189	232	4100	0	227.556	0.090	119	232	4100	4	0.	0.
190	232	4300	0	227.556	0.091	120	232	4300	4	0.	0.
191	232	4500	0	227.556	0.097	121	232	4500	4	0.	0.
192	232	4700	0	227.556	0.047	122	232	4700	16	0.	0.
193	232	4900	20	227.556	0.043	123	232	4900	17	0.	0.
194	232	5100	0	227.556	0.047	124	232	5100	35	0.	0.
195	232	5300	0	227.556	0.164	125	232	5300	8	0.	0.
196	232	5500	0	227.556	0.238	126	232	5500	0	0.	0.
197	232	5700	0	227.556	0.247	127	232	5700	0	0.	0.
198	232	5900	0	227.556	0.164	128	232	5900	7	0.	0.
199	232	6100	0	227.556	0.248	129	232	6100	1	0.	0.
200	232	6300	0	227.556	0.419	130	232	6300	0	0.	0.
201	232	6500	0	227.556	0.123	131	232	6500	1	0.	0.
202	232	6700	0	227.556	0.089	132	232	6700	6	0.	0.
203	232	6900	0	227.556	0.169	133	232	6900	0	0.	0.
204	232	7100	0	227.556	0.511	134	232	7100	1	0.	0.
205	232	7300	0	227.556	0.297	135	232	7300	1	0.	0.
206	232	7500	0	227.556	0.290	136	232	7500	0	0.	0.
207	232	7700	0	227.556	0.129	137	232	7700	4	0.	0.
208	232	7900	0	227.556	0.103	138	232	7900	35	0.	0.
209	232	8100	0	227.556	0.153	139	232	8100	23	0.	0.
210	232	8300	0	227.556	0.217	140	232	8300	0	0.	0.
211	232	8500	0	227.556	0.331	141	232	8500	7	0.	0.
212	232	8700	0	227.556	0.347	142	232	8700	4	0.	0.
213	232	8900	0	227.556	0.110	143	232	8900	9	0.	0.
214	232	9100	0	227.556	0.226	144	232	9100	13	0.	0.
215	232	9300	1	227.556	0.070	145	232	9300	0	0.	0.
216	232	9500	0	227.556	0.121	146	232	9500	7	0.	0.
217	232	9700	0	227.556	0.162	147	232	9700	9	0.	0.
218	232	9900	0	227.556	0.042	148	232	9900	0	0.	0.
219	232	10100	0	227.556	0.050	149	232	10100	0	0.	0.
220	232	10300	0	227.556	0.084	150	232	10300	6	0.	0.
221	232	10500	0	227.556	0.124	151	232	10500	4	0.	0.
222	232	10700	0	227.556	0.183	152	232	10700	0	0.	0.
223	232	10900	0	227.556	0.150	153	232	10900	4	0.	0.
224	232	11100	4	227.556	0.087	154	232	11100	1	0.	0.
225	232	11300	0	227.556	0.127	155	232	11300	0	0.	0.
226	232	11500	0	227.556	0.157	156	232	11500	0	0.	0.
227	232	11700	0	227.556	0.218	157	232	11700	0	0.	0.
228	232	11900	0	227.556	0.045	158	232	11900	1	0.	0.
229	232	12100	0	227.556	0.063	159	232	12100	0	0.	0.
230	232	12300	0	227.556	0.124	160	232	12300	0	0.	0.
231	232	12500	0	227.556	0.186	161	232	12500	11	0.	0.
232	232	12700	0	227.556	0.186	162	232	12700	28	0.	0.

(Continued)

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Table 3 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. WT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. WT. (FT.)
153	214	1440	0	227.556	0.184	163	236	1400	0	3.703	0.271
154	216	1600	0	227.556	0.071	164	236	1600	8	227.556	0.271
155	216	1700	0	227.556	0.089	165	236	1800	4	3.931	0.223
156	216	2000	0	227.556	0.089	166	236	2000	0	5.007	0.271
157	216	2200	0	227.556	0.079	167	236	2200	0	227.556	0.271
158	216	2400	0	227.556	0.169	168	236	2400	8	227.556	0.276
159	217	200	0	227.556	0.144	169	237	200	0	227.556	0.162
170	217	400	0	227.556	0.104	170	237	400	0	227.556	0.198
171	217	600	0	227.556	0.124	171	237	600	0	227.556	0.277
172	217	800	0	227.556	0.067	172	237	800	0	227.556	0.221
173	217	1000	0	227.556	0.156	173	237	1000	0	227.556	0.227
174	217	1200	1	227.556	0.043	174	237	1200	0	3.703	0.208
175	217	1400	0	227.556	0.091	175	237	1400	0	3.702	0.342
176	217	1600	0	227.556	0.133	176	237	1600	1	227.556	0.185
177	217	1800	0	227.556	0.186	177	237	1800	0	227.556	0.213
178	217	2000	0	227.556	0.096	178	237	2000	0	3.703	0.270
179	217	2200	0	227.556	0.225	179	237	2200	7	3.931	1.852
180	217	2400	0	227.556	0.144	180	237	2400	4	4.813	1.670
181	218	200	0	227.556	0.129	181	238	200	0	4.055	0.880
182	218	400	0	227.556	0.136	182	238	400	10	3.703	2.748
183	218	600	0	227.556	0.082	183	238	600	15	3.703	3.720
184	218	800	0	227.556	0.069	184	238	800	0	3.703	0.580
185	218	1000	0	227.556	0.094	185	238	1000	15	227.556	0.491
186	218	1200	0	227.556	0.151	186	238	1200	8	3.703	2.545
187	218	1400	0	227.556	0.151	187	238	1400	0	3.703	0.310
188	218	1600	0	227.556	0.081	188	238	1600	5	4.819	0.189
189	218	1800	0	227.556	0.140	189	238	1800	39	0.	0.
190	218	2000	0	227.556	0.178	190	238	2000	41	0.	0.
191	218	2200	0	227.556	0.054	191	238	2200	0	0.	0.
192	218	2400	0	227.556	0.073	192	238	2400	0	0.	0.
193	219	200	0	227.556	0.120	193	239	200	0	227.556	0.218
194	219	400	0	227.556	0.074	194	239	400	27	0.	0.
195	219	600	0	227.556	0.110	195	239	600	25	0.	0.
196	219	800	0	227.556	0.174	196	239	800	0	0.	0.
197	219	1000	0	227.556	0.072	197	239	1000	41	0.	0.
198	219	1200	0	227.556	0.315	198	239	1200	0	0.	0.
199	219	1400	0	227.556	0.226	199	239	1400	0	0.	0.
200	219	1600	0	227.556	0.055	200	239	1600	0	0.	0.
201	219	1800	0	227.556	0.164	201	239	1800	0	0.	0.
202	219	2000	0	227.556	0.170	202	239	2000	25	0.	0.
203	219	2200	0	227.556	0.141	203	239	2200	51	0.	0.
204	219	2400	0	227.556	0.125	204	239	2400	0	0.	0.
205	240	200	0	227.556	0.147	205	240	200	0	0.	0.
206	240	400	0	227.556	0.146	206	240	400	0	0.	0.
207	240	600	0	227.556	0.139	207	240	600	0	0.	0.
208	240	800	0	227.556	0.064	208	240	800	0	0.	0.
209	240	1000	0	227.556	0.071	209	240	1000	0	0.	0.
210	240	1200	0	227.556	0.087	210	240	1200	30	0.	0.
211	240	1400	0	227.556	0.084	211	240	1400	0	227.556	0.215
212	240	1600	0	227.556	0.139	212	240	1600	11	3.703	0.626
213	240	1800	0	227.556	0.115	213	240	1800	0	0.	0.
214	240	2000	0	227.556	0.125	214	240	2000	0	0.	0.
215	240	2200	0	227.556	0.200	215	240	2200	0	0.	0.
216	240	2400	0	227.556	0.031	216	240	2400	0	0.	0.
217	241	200	0	227.556	0.070	217	241	200	1	227.556	0.134
218	241	400	0	227.556	0.112	218	241	400	27	0.	0.
219	241	600	0	227.556	0.233	219	241	600	22	0.	0.
220	241	800	0	227.556	0.199	220	241	800	0	227.556	0.278
221	241	1000	0	227.556	0.047	221	241	1000	10	3.703	0.870

(Continued)

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Table 3 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)
222	241	1400	0	227-556	0.113	222	241	1200	2	0	0
223	241	1400	0	227-556	0.175	223	241	1400	16	0	0
224	241	1600	0	227-556	0.128	224	241	1600	54	0	0
225	241	1800	0	227-556	0.208	225	241	1800	18	0	0
226	241	2000	0	227-556	0.291	226	241	2000	35	0	0
227	241	2200	0	227-556	0.167	227	241	2200	9	0	0
228	241	2400	0	227-556	0.131	228	241	2400	1	0	0
229	242	0000	0	227-556	0.155	229	242	0000	6	0	0
230	242	0200	0	227-556	0.242	230	242	0200	3	0	0
231	242	0400	0	227-556	0.445	231	242	0400	0	0	0
232	242	0600	0	227-556	0.510	232	242	0600	0	0	0
233	242	0800	0	227-556	0.319	233	242	0800	0	0	0
234	242	1000	0	227-556	0.265	234	242	1000	11	0	0
235	242	1200	0	227-556	0.156	235	242	1200	0	0	0
236	242	1400	0	227-556	0.169	236	242	1400	7	0	0
237	242	1600	0	227-556	0.119	237	242	1600	0	0	0
238	242	1800	0	227-556	0.255	238	242	1800	0	0	0
239	242	2000	0	227-556	0.105	239	242	2000	8	0	0
240	242	2200	0	227-556	0.127	240	242	2200	7	0	0
241	243	0000	0	227-556	0.186	241	243	0000	0	0	0
242	243	0200	0	227-556	0.112	242	243	0200	7	0	0
243	243	0400	0	227-556	0.070	243	243	0400	9	0	0
244	243	0600	0	227-556	0.198	244	243	0600	41	0	0
245	243	0800	0	227-556	0.283	245	243	0800	0	0	0
246	243	1000	0	227-556	0.057	246	243	1000	13	0	0
247	243	1200	0	227-556	0.086	247	243	1200	8	0	0
248	243	1400	0	227-556	0.071	248	243	1400	0	0	0
249	243	1600	0	227-556	0.058	249	243	1600	6	0	0
250	243	1800	0	227-556	0.136	250	243	1800	0	0	0
251	243	2000	0	227-556	0.106	251	243	2000	1	0	0
252	243	2200	0	227-556	0.289	252	243	2200	0	0	0
253	244	0000	0	227-556	0.102	253	244	0000	0	0	0
254	244	0200	0	227-556	0.093	254	244	0200	0	0	0
255	244	0400	0	227-556	0.045	255	244	0400	0	0	0
256	244	0600	0	227-556	0.104	256	244	0600	0	0	0
257	244	0800	0	227-556	0.033	257	244	0800	11	0	0
258	244	1000	0	227-556	0.076	258	244	1000	12	0	0
259	244	1200	0	227-556	0.180	259	244	1200	0	0	0
260	244	1400	0	227-556	0.091	260	244	1400	0	0	0
261	244	1600	0	227-556	0.051	261	244	1600	0	0	0
262	244	1800	0	227-556	0.049	262	244	1800	0	0	0
263	244	2000	0	227-556	0.101	263	244	2000	0	0	0
264	244	2200	0	227-556	0.056	264	244	2200	0	0	0
265	245	0000	0	227-556	0.035	265	245	0000	0	0	0
266	245	0200	0	227-556	0.104	266	245	0200	0	0	0
267	245	0400	0	227-556	0.051	267	245	0400	0	0	0
268	245	0600	0	227-556	0.036	268	245	0600	0	0	0
269	245	0800	0	227-556	0.026	269	245	0800	0	0	0
270	245	1000	0	227-556	0.108	270	245	1000	0	0	0
271	245	1200	0	227-556	0.050	271	245	1200	0	0	0
272	245	1400	0	227-556	0.142	272	245	1400	0	0	0
273	245	1600	0	227-556	0.083	273	245	1600	0	0	0
274	245	1800	0	227-556	0.087	274	245	1800	0	0	0
275	245	2000	0	227-556	0.073	275	245	2000	0	0	0
276	245	2200	0	227-556	0.049	276	245	2200	0	0	0
277	246	0000	0	227-556	0.162	277	246	0000	0	0	0
278	246	0200	0	227-556	0.194	278	246	0200	0	0	0
279	246	0400	0	227-556	0.087	279	246	0400	0	0	0
280	246	0600	0	227-556	0.087	280	246	0600	0	0	0

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Table 3 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAO POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAO POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)
241	246	1000	0	227.556	0.118	291	246	1000	25	0.	0.
242	246	1201	0	227.556	0.109	292	246	1200	54	0.	0.
243	246	1400	0	227.556	0.085	293	246	1600	20	0.	0.
244	246	1600	0	227.556	0.121	294	246	1800	12	0.	0.
245	246	1800	0	5.231	0.108	295	246	2000	5	0.	0.
246	246	2000	0	4.055	0.106	296	246	2200	15	0.	0.
247	246	2200	0	227.556	0.158	297	246	2400	14	0.	0.
248	246	2400	0	227.556	0.192	298	246	2600	0	0.	0.
249	247	200	0	227.556	0.185	299	247	200	0	0.	0.
250	247	400	0	227.556	0.128	300	247	400	16	0.	0.
251	247	600	0	227.556	0.231	301	247	600	43	0.	0.
252	247	800	0	4.055	0.147	302	247	800	40	0.	0.
253	247	1000	0	4.481	0.158	303	247	1000	17	0.	0.
254	247	1200	0	6.155	0.196	304	247	1200	0	0.	0.
255	247	1400	0	4.464	0.228	305	247	1400	20	0.	0.
256	247	1600	0	4.819	0.208	306	247	1600	0	0.	0.
257	247	1800	0	4.819	0.237	307	247	1800	0	0.	0.
258	247	2000	0	5.017	0.189	308	247	2000	42	0.	0.
259	247	2200	0	5.211	0.161	309	247	2200	0	0.	0.
260	247	2400	0	5.607	0.135	310	247	2400	0	0.	0.
261	248	200	0	4.819	0.128	311	248	200	0	0.	0.
262	248	400	0	4.655	0.159	312	248	400	0	0.	0.
263	248	600	0	227.556	0.247	313	248	600	0	0.	0.
264	248	800	0	5.007	0.264	314	248	800	0	0.	0.
265	248	1000	0	227.556	0.354	315	248	1000	0	0.	0.
266	248	1200	0	5.007	0.211	316	248	1200	0	0.	0.
267	248	1400	0	227.556	0.251	317	248	1400	0	0.	0.
268	248	1600	0	4.055	0.220	318	248	1600	0	0.	0.
269	248	1800	0	4.464	0.179	319	248	1800	0	0.	0.
270	248	2000	0	227.556	0.203	320	248	2000	44	0.	0.
271	248	2200	0	227.556	0.292	321	248	2200	13	0.	0.
272	248	2400	0	227.556	0.261	322	248	2400	7	0.	0.
273	249	200	0	227.556	0.415	323	249	200	6	0.	0.
274	249	400	0	227.556	0.422	324	249	400	12	0.	0.
275	249	600	0	227.556	0.423	325	249	600	8	0.	0.
276	249	800	0	227.556	0.423	326	249	800	8	0.	0.
277	249	1000	0	227.556	0.300	327	249	1000	14	0.	0.
278	249	1200	0	227.556	0.482	328	249	1200	57	0.	0.
279	249	1400	0	227.556	0.279	329	249	1400	10	0.	0.
280	249	1600	0	227.556	0.566	330	249	1600	11	0.	0.
281	249	1800	0	227.556	0.647	331	249	1800	59	0.	0.
282	249	2000	0	227.556	0.573	332	249	2000	9	0.	0.
283	249	2200	0	6.817	0.751	333	249	2200	8	0.	0.
284	249	2400	0	227.555	0.550	334	249	2400	5	0.	0.
285	250	200	0	227.555	0.650	335	250	200	9	0.	0.
286	250	400	0	5.007	0.545	336	250	400	9	0.	0.
287	250	600	0	6.145	0.515	337	250	600	1	0.	0.
288	250	800	0	6.441	0.349	338	250	800	7	0.	0.
289	250	1000	0	4.164	0.301	339	250	1000	3	0.	0.
290	250	1200	0	227.556	0.599	340	250	1200	6	0.	0.
291	250	1400	0	4.055	0.477	341	250	1400	1	0.	0.
292	250	1600	0	227.556	0.375	342	250	1600	3	0.	0.
293	250	1800	0	227.556	0.092	343	250	1800	1	0.	0.
294	250	2000	0	227.556	0.134	344	250	2000	1	0.	0.
295	250	2200	0	227.556	0.319	345	250	2200	19	0.	0.
296	250	2400	0	227.556	0.073	346	250	2400	1	0.	0.
297	251	200	0	227.556	0.269	347	251	200	1	0.	0.
298	251	400	0	227.556	0.074	348	251	400	2	0.	0.
299	251	600	0	227.556	0.261	349	251	600	6	0.	0.

(Continued)

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Table 3 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAO POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAO POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)
341	251	1000	0	227.556	0.211	341	251	1000	0	227.556	0.211
342	251	1200	0	227.556	0.079	342	251	1200	0	227.556	0.079
343	251	1400	0	227.556	0.123	343	251	1400	0	227.556	0.123
344	251	1600	0	227.556	0.164	344	251	1600	0	227.556	0.164
345	251	1800	0	227.556	0.228	345	251	1800	0	227.556	0.228
346	251	2000	0	227.556	0.159	346	251	2000	0	227.556	0.159
347	251	2200	0	227.556	0.119	347	251	2200	0	227.556	0.119
348	251	2400	0	227.556	0.171	348	251	2400	0	227.556	0.171
349	252	0000	0	227.556	0.134	349	252	0000	0	227.556	0.134
350	252	0200	0	227.556	0.258	350	252	0200	0	227.556	0.258
351	252	0400	0	227.556	0.279	351	252	0400	0	227.556	0.279
352	252	0600	0	227.556	0.241	352	252	0600	0	227.556	0.241
353	252	0800	0	227.556	0.258	353	252	0800	0	227.556	0.258
354	252	1000	0	227.556	0.290	354	252	1000	0	227.556	0.290
355	252	1200	0	227.556	0.259	355	252	1200	0	227.556	0.259
356	252	1400	0	227.556	0.257	356	252	1400	0	227.556	0.257
357	252	1600	0	227.556	0.212	357	252	1600	0	227.556	0.212
358	252	1800	0	227.556	0.264	358	252	1800	0	227.556	0.264
359	252	2000	0	227.556	0.169	359	252	2000	0	227.556	0.169
360	252	2200	0	227.556	0.129	360	252	2200	0	227.556	0.129
361	253	0000	0	227.556	0.159	361	253	0000	0	227.556	0.159
362	253	0200	0	227.556	0.189	362	253	0200	0	227.556	0.189
363	253	0400	0	227.556	0.076	363	253	0400	0	227.556	0.076
364	253	0600	0	227.556	0.133	364	253	0600	0	227.556	0.133
365	253	0800	0	227.556	0.192	365	253	0800	0	227.556	0.192
366	253	1000	0	227.556	0.224	366	253	1000	0	227.556	0.224
367	253	1200	0	227.556	0.285	367	253	1200	0	227.556	0.285
368	253	1400	0	227.556	0.107	368	253	1400	0	227.556	0.107
369	253	1600	0	227.556	0.193	369	253	1600	0	227.556	0.193
370	253	1800	0	227.556	0.200	370	253	1800	0	227.556	0.200
371	253	2000	0	227.556	0.184	371	253	2000	0	227.556	0.184
372	253	2200	0	227.556	0.656	372	253	2200	0	227.556	0.656
373	254	0000	0	227.556	0.765	373	254	0000	0	227.556	0.765
374	254	0200	0	227.556	0.644	374	254	0200	0	227.556	0.644
375	254	0400	0	227.556	0.501	375	254	0400	0	227.556	0.501
376	254	0600	0	227.556	0.375	376	254	0600	0	227.556	0.375
377	254	0800	0	227.556	0.433	377	254	0800	0	227.556	0.433
378	254	1000	0	227.556	0.361	378	254	1000	0	227.556	0.361
379	254	1200	0	227.556	0.346	379	254	1200	0	227.556	0.346
380	254	1400	0	227.556	0.196	380	254	1400	0	227.556	0.196
381	254	1600	0	227.556	0.107	381	254	1600	0	227.556	0.107
382	254	1800	0	227.556	0.145	382	254	1800	0	227.556	0.145
383	254	2000	0	227.556	0.131	383	254	2000	0	227.556	0.131
384	254	2200	0	227.556	0.186	384	254	2200	0	227.556	0.186
385	255	0000	0	227.556	0.130	385	255	0000	0	227.556	0.130
386	255	0200	0	227.556	0.208	386	255	0200	0	227.556	0.208
387	255	0400	0	227.556	0.256	387	255	0400	0	227.556	0.256
388	255	0600	0	227.556	0.196	388	255	0600	0	227.556	0.196
389	255	0800	0	227.556	0.150	389	255	0800	0	227.556	0.150
390	255	1000	0	227.556	0.191	390	255	1000	0	227.556	0.191
391	255	1200	0	227.556	0.344	391	255	1200	0	227.556	0.344
392	255	1400	0	227.556	0.238	392	255	1400	0	227.556	0.238
393	255	1600	0	227.556	0.322	393	255	1600	0	227.556	0.322
394	255	1800	0	227.556	0.152	394	255	1800	0	227.556	0.152
395	255	2000	0	227.556	0.299	395	255	2000	0	227.556	0.299
396	255	2200	0	227.556	0.129	396	255	2200	0	227.556	0.129
397	256	0000	0	227.556	0.256	397	256	0000	0	227.556	0.256
398	256	0200	0	227.556	0.070	398	256	0200	0	227.556	0.070

(Continued)

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(Continued)

Table 4 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)
517	322	2330	0	227.556	0.067	517	322	2330	0	5.007	0.688
518	323	1330	0	227.556	0.112	518	323	1330	0	4.819	0.475
519	323	330	0	227.556	0.115	519	323	330	0	227.556	0.540
520	323	530	0	227.556	0.237	520	323	530	0	227.556	0.390
521	323	730	0	227.556	0.085	521	323	730	0	227.556	0.267
522	323	930	0	227.556	0.124	522	323	930	0	227.556	0.277
523	323	1130	0	227.556	0.106	523	323	1130	0	227.556	0.174
524	323	1330	0	227.556	0.109	524	323	1330	0	227.556	0.230
525	323	1530	0	227.556	0.212	525	323	1530	0	227.556	0.315
526	323	1730	0	227.556	0.143	526	323	1730	0	227.556	0.337
527	323	1930	0	227.556	0.167	527	323	1930	0	227.556	0.391
528	323	2130	0	227.556	0.160	528	323	2130	0	227.556	0.290
529	323	2330	0	227.556	0.174	529	323	2330	0	227.556	0.833
530	324	130	0	227.556	0.217	530	324	130	0	227.556	0.627
531	324	330	0	227.556	0.194	531	324	330	0	227.556	1.093
532	324	530	0	227.556	0.279	532	324	530	0	227.556	1.870
533	324	730	0	227.556	0.222	533	324	730	0	227.556	1.847
534	324	930	0	227.556	0.222	534	324	930	0	227.556	1.829
535	324	1130	0	227.556	0.201	535	324	1130	0	227.556	1.187
536	324	1330	0	227.556	0.228	536	324	1330	0	227.556	1.034
537	324	1530	0	227.556	0.313	537	324	1530	0	227.556	2.846
538	324	1730	0	227.556	0.591	538	324	1730	0	227.556	2.319
539	324	1930	0	5.432	0.564	539	324	1930	0	5.432	7.832
540	324	2130	0	5.211	0.347	540	324	2130	0	5.211	7.035
541	324	2330	0	227.556	0.532	541	324	2330	0	227.556	7.687
542	325	130	0	5.211	0.525	542	325	130	0	5.211	7.288
543	325	330	0	5.007	0.528	543	325	330	0	5.007	6.550
544	325	530	0	5.432	0.543	544	325	530	0	5.432	7.410
545	325	730	0	5.432	0.824	545	325	730	0	5.432	7.728
546	325	930	0	4.819	0.879	546	325	930	0	4.819	7.991
547	325	1130	0	5.673	0.750	547	325	1130	0	5.673	6.555
548	325	1330	0	5.432	0.668	548	325	1330	0	5.432	5.752
549	325	1530	0	4.819	0.630	549	325	1530	0	4.819	5.389
550	325	1730	0	4.055	0.680	550	325	1730	0	4.055	4.632
551	325	1930	0	5.432	0.751	551	325	1930	0	5.432	4.049
552	325	2130	0	5.007	0.754	552	325	2130	0	5.007	3.358
553	325	2330	0	5.007	0.950	553	325	2330	0	5.432	2.780
554	326	130	0	4.819	0.990	554	326	130	0	5.432	2.022
555	326	330	0	4.819	0.691	555	326	330	0	5.007	2.225
556	326	530	0	4.644	0.608	556	326	530	0	5.007	2.054
557	326	730	0	4.055	0.467	557	326	730	0	4.681	1.510
558	326	930	0	3.931	0.247	558	326	930	0	4.481	1.373
559	326	1130	0	227.556	0.191	559	326	1130	0	4.055	0.939
560	326	1330	0	227.556	0.113	560	326	1330	0	4.055	0.789
561	326	1530	0	227.556	0.160	561	326	1530	0	227.556	0.584
562	326	1730	0	227.556	0.114	562	326	1730	0	227.556	0.438
563	326	1930	0	227.556	0.133	563	326	1930	0	227.556	0.421
564	326	2130	0	227.556	0.140	564	326	2130	0	227.556	0.319
565	326	2330	0	227.556	0.183	565	326	2330	0	227.556	0.281
566	327	130	0	227.556	0.162	566	327	130	0	227.556	0.192
567	327	330	0	227.556	0.136	567	327	330	0	227.556	0.314
568	327	530	0	227.556	0.276	568	327	530	0	227.556	0.359
569	327	730	0	227.556	0.094	569	327	730	0	227.556	0.177
570	327	930	0	227.556	0.094	570	327	930	0	227.556	0.245
571	327	1130	0	227.556	0.176	571	327	1130	0	5.703	0.232
572	327	1330	0	227.556	0.258	572	327	1330	0	227.556	0.266
573	327	1530	0	227.556	0.980	573	327	1530	0	3.703	0.390
574	327	1730	0	227.556	0.251	574	327	1730	0	3.814	0.487
575	327	1930	0	227.556	0.484	575	327	1930	0	227.556	1.470

(Continued)

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Table 4 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAO POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAO POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)
458	318	130	1	5.007	0.233	458	318	130	0	5.007	1.687
459	319	330	0	227.556	0.284	459	318	330	0	5.007	1.684
460	318	530	1	4.819	0.265	460	318	530	0	5.231	1.947
461	318	730	0	4.188	0.298	461	318	730	1	5.673	2.448
462	318	930	0	5.211	0.259	462	318	930	0	5.936	2.019
463	318	1130	0	227.556	0.212	463	318	1130	0	6.225	1.753
464	318	1330	0	227.556	0.254	464	318	1330	1	5.936	1.644
465	318	1530	0	227.556	0.180	465	318	1530	0	6.225	1.967
466	318	1730	0	227.556	0.164	466	318	1730	0	5.673	1.986
467	318	1930	0	227.556	0.264	467	318	1930	0	6.225	1.809
468	318	2130	0	227.556	0.176	468	318	2130	0	6.343	1.737
469	318	2330	0	227.556	0.151	469	318	2330	0	6.225	1.639
470	319	130	0	227.556	0.147	470	319	130	0	6.343	1.708
471	319	330	0	227.556	0.144	471	319	330	0	5.432	1.432
472	319	530	0	5.007	0.115	472	319	530	0	6.343	1.220
473	319	730	0	227.556	0.091	473	319	730	0	5.936	1.090
474	319	930	0	227.556	0.098	474	319	930	1	5.673	0.786
475	319	1130	0	227.556	0.172	475	319	1130	0	5.432	0.563
476	319	1330	0	227.556	0.129	476	319	1330	0	5.211	0.350
477	319	1530	0	227.556	0.143	477	319	1530	0	227.556	0.254
478	319	1730	0	227.556	0.061	478	319	1730	0	227.556	0.264
479	319	1930	0	227.556	0.077	479	319	1930	0	5.936	0.200
480	319	2130	0	227.556	0.175	480	319	2130	0	6.481	0.280
481	319	2330	0	227.556	0.068	481	319	2330	0	227.556	0.479
482	320	130	0	227.556	0.099	482	320	130	0	227.556	0.525
483	320	330	0	227.556	0.065	483	320	330	0	227.556	0.652
484	320	530	0	227.556	0.113	484	320	530	0	227.556	1.100
485	320	730	0	4.819	0.129	485	320	730	0	7.288	1.384
486	320	930	0	227.556	0.143	486	320	930	1	7.728	1.768
487	320	1130	0	227.556	0.201	487	320	1130	0	9.225	2.064
488	320	1330	0	227.556	0.127	488	320	1330	0	5.225	2.147
489	320	1530	0	4.819	0.195	489	320	1530	0	5.225	1.914
490	320	1730	0	5.931	0.214	490	320	1730	0	7.288	1.791
491	320	1930	0	4.188	0.208	491	320	1930	0	7.288	1.595
492	320	2130	0	227.556	0.208	492	320	2130	0	0.	0.
493	320	2330	0	227.556	0.243	493	320	2330	0	0.	0.
494	321	130	0	227.556	0.157	494	321	130	0	7.728	1.532
495	321	330	0	227.556	0.162	495	321	330	0	6.896	1.261
496	321	530	0	4.053	0.182	496	321	530	0	7.728	1.407
497	321	730	0	4.188	0.206	497	321	730	0	6.543	1.169
498	321	930	0	5.055	0.122	498	321	930	0	5.007	1.033
499	321	1130	0	227.556	0.138	499	321	1130	0	227.556	0.874
500	321	1330	0	227.556	0.082	500	321	1330	0	227.556	0.835
501	321	1530	0	227.556	0.083	501	321	1530	0	227.556	0.610
502	321	1730	0	227.556	0.084	502	321	1730	0	227.556	0.480
503	321	1930	0	227.556	0.082	503	321	1930	0	227.556	0.307
504	321	2130	0	227.556	0.105	504	321	2130	0	227.556	0.263
505	321	2330	0	227.556	0.071	505	321	2330	0	227.556	0.229
506	322	130	0	227.556	0.141	506	322	130	1	227.556	0.171
507	322	330	0	227.556	0.076	507	322	330	0	227.556	0.202
508	322	530	0	227.556	0.115	508	322	530	0	227.556	0.179
509	322	730	0	227.556	0.217	509	322	730	0	227.556	0.409
510	322	930	0	227.556	0.246	510	322	930	0	4.664	0.934
511	322	1130	0	227.556	0.194	511	322	1130	2	5.007	1.144
512	322	1330	0	227.556	0.153	512	322	1330	0	5.673	1.420
513	322	1530	0	227.556	0.188	513	322	1530	0	5.673	1.237
514	322	1730	0	227.556	0.137	514	322	1730	2	5.211	1.143
515	322	1930	0	227.556	0.109	515	322	1930	0	5.673	0.893
516	322	2130	0	227.556	0.141	516	322	2130	0	227.556	0.908

(Continued)

Table 4 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	SIG. PER. (SEC.)	SIG. MT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	SIG. PER. (SEC.)	SIG. MT. (FT.)	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)
379	313	330	0	227.556	0.123	313	330	0	227.556	0	4.330	0.714
410	313	330	0	227.556	0.111	313	330	0	227.556	0	4.330	0.599
431	313	330	0	227.556	0.233	313	330	0	227.556	0	4.330	0.486
432	313	330	0	227.556	0.068	313	330	0	227.556	0	4.330	0.486
433	313	330	0	227.556	0.085	313	330	0	227.556	0	4.330	0.486
434	313	330	0	227.556	0.165	313	330	0	227.556	0	4.330	0.486
435	313	330	0	227.556	0.161	313	330	0	227.556	0	4.330	0.486
404	313	330	0	227.556	0.159	313	330	0	227.556	0	4.330	0.486
437	313	330	0	227.556	0.224	313	330	0	227.556	0	4.330	0.486
438	313	330	0	227.556	0.269	313	330	0	227.556	0	4.330	0.486
439	313	330	0	227.556	0.114	313	330	0	227.556	0	4.330	0.486
410	314	330	0	227.556	0.131	314	330	0	227.556	0	4.330	0.486
411	314	330	0	227.556	0.072	314	330	0	227.556	0	4.330	0.486
412	314	330	0	227.556	0.166	314	330	0	227.556	0	4.330	0.486
413	314	330	0	227.556	0.143	314	330	0	227.556	0	4.330	0.486
414	314	330	0	227.556	0.150	314	330	0	227.556	0	4.330	0.486
415	314	330	0	227.556	0.199	314	330	0	227.556	0	4.330	0.486
416	314	330	0	227.556	0.166	314	330	0	227.556	0	4.330	0.486
417	314	330	0	227.556	0.213	314	330	0	227.556	0	4.330	0.486
418	314	330	0	227.556	0.187	314	330	0	227.556	0	4.330	0.486
419	314	330	0	227.556	0.171	314	330	0	227.556	0	4.330	0.486
420	314	330	0	227.556	0.122	314	330	0	227.556	0	4.330	0.486
421	314	330	0	227.556	0.169	314	330	0	227.556	0	4.330	0.486
422	315	330	0	227.556	0.152	315	330	0	227.556	0	4.330	0.486
423	315	330	0	227.556	0.151	315	330	0	227.556	0	4.330	0.486
424	315	330	0	227.556	0.175	315	330	0	227.556	0	4.330	0.486
425	315	330	0	227.556	0.186	315	330	0	227.556	0	4.330	0.486
426	315	330	0	227.556	0.366	315	330	0	227.556	0	4.330	0.486
427	315	330	0	227.556	0.231	315	330	0	227.556	0	4.330	0.486
428	315	330	0	227.556	0.265	315	330	0	227.556	0	4.330	0.486
429	315	330	0	227.556	0.269	315	330	0	227.556	0	4.330	0.486
430	315	330	0	227.556	0.250	315	330	0	227.556	0	4.330	0.486
431	315	330	0	227.556	0.259	315	330	0	227.556	0	4.330	0.486
432	315	330	0	227.556	0.242	315	330	0	227.556	0	4.330	0.486
433	315	330	0	227.556	0.192	315	330	0	227.556	0	4.330	0.486
434	316	330	0	227.556	0.181	316	330	0	227.556	0	4.330	0.486
435	316	330	0	227.556	0.129	316	330	0	227.556	0	4.330	0.486
436	316	330	0	227.556	0.132	316	330	0	227.556	0	4.330	0.486
437	316	330	0	227.556	0.120	316	330	0	227.556	0	4.330	0.486
438	316	330	0	227.556	0.142	316	330	0	227.556	0	4.330	0.486
439	316	330	0	227.556	0.181	316	330	0	227.556	0	4.330	0.486
440	316	330	0	227.556	0.064	316	330	0	227.556	0	4.330	0.486
441	316	330	0	227.556	0.115	316	330	0	227.556	0	4.330	0.486
442	316	330	0	227.556	0.041	316	330	0	227.556	0	4.330	0.486
443	316	330	0	227.556	0.124	316	330	0	227.556	0	4.330	0.486
444	316	330	0	227.556	0.035	316	330	0	227.556	0	4.330	0.486
445	317	330	0	227.556	0.096	317	330	0	227.556	0	4.330	0.486
446	317	330	0	227.556	0.060	317	330	0	227.556	0	4.330	0.486
447	317	330	0	227.556	0.072	317	330	0	227.556	0	4.330	0.486
448	317	330	0	227.556	0.051	317	330	0	227.556	0	4.330	0.486
449	317	330	0	227.556	0.051	317	330	0	227.556	0	4.330	0.486
450	317	330	0	227.556	0.083	317	330	0	227.556	0	4.330	0.486
451	317	330	0	227.556	0.047	317	330	0	227.556	0	4.330	0.486
452	317	330	0	227.556	0.073	317	330	0	227.556	0	4.330	0.486
453	317	330	0	227.556	0.149	317	330	0	227.556	0	4.330	0.486
454	317	330	0	227.556	0.213	317	330	0	227.556	0	4.330	0.486
455	317	330	0	227.556	0.207	317	330	0	227.556	0	4.330	0.486
456	317	330	0	227.556	0.220	317	330	0	227.556	0	4.330	0.486
457	317	330	0	227.556	0.227	317	330	0	227.556	0	4.330	0.486

(Continued)

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Table 4 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)
340	308	530	0	227.556	0.089	340	308	530	0	227.556	0.725
341	308	730	0	227.556	0.119	341	308	730	0	227.556	0.758
342	308	930	0	227.556	0.118	342	308	930	0	227.556	0.751
343	308	1130	0	227.556	0.076	343	308	1130	0	227.556	0.647
344	308	1330	0	227.556	0.083	344	308	1330	0	227.556	0.600
345	308	1530	0	227.556	0.110	345	308	1530	0	227.556	0.820
346	308	1730	0	227.556	0.110	346	308	1730	0	227.556	0.750
347	308	1930	0	227.556	0.073	347	308	1930	0	227.556	0.750
348	308	2130	0	227.556	0.073	348	308	2130	0	227.556	0.455
349	308	2330	0	227.556	0.073	349	308	2330	0	227.556	0.468
350	309	150	0	227.556	0.083	350	309	150	0	227.556	0.468
351	309	350	0	227.556	0.083	351	309	350	0	227.556	0.351
352	309	550	0	227.556	0.083	352	309	550	0	227.556	0.351
353	309	750	0	227.556	0.083	353	309	750	0	227.556	0.351
354	309	950	0	227.556	0.083	354	309	950	0	227.556	0.351
355	309	1150	0	227.556	0.083	355	309	1150	0	227.556	0.351
356	309	1350	0	227.556	0.083	356	309	1350	0	227.556	0.351
357	309	1550	0	227.556	0.083	357	309	1550	0	227.556	0.351
358	309	1750	0	227.556	0.083	358	309	1750	0	227.556	0.351
359	309	1950	0	227.556	0.083	359	309	1950	0	227.556	0.351
360	309	2150	0	227.556	0.083	360	309	2150	0	227.556	0.351
361	310	150	0	227.556	0.083	361	310	150	0	227.556	0.351
362	310	350	0	227.556	0.083	362	310	350	0	227.556	0.351
363	310	550	0	227.556	0.083	363	310	550	0	227.556	0.351
364	310	750	0	227.556	0.083	364	310	750	0	227.556	0.351
365	310	950	0	227.556	0.083	365	310	950	0	227.556	0.351
366	310	1150	0	227.556	0.083	366	310	1150	0	227.556	0.351
367	310	1350	0	227.556	0.083	367	310	1350	0	227.556	0.351
368	310	1550	0	227.556	0.083	368	310	1550	0	227.556	0.351
369	310	1750	0	227.556	0.083	369	310	1750	0	227.556	0.351
370	310	1950	0	227.556	0.083	370	310	1950	0	227.556	0.351
371	310	2150	0	227.556	0.083	371	310	2150	0	227.556	0.351
372	310	2350	0	227.556	0.083	372	310	2350	0	227.556	0.351
373	311	150	0	227.556	0.083	373	311	150	0	227.556	0.351
374	311	350	0	227.556	0.083	374	311	350	0	227.556	0.351
375	311	550	0	227.556	0.083	375	311	550	0	227.556	0.351
376	311	750	0	227.556	0.083	376	311	750	0	227.556	0.351
377	311	950	0	227.556	0.083	377	311	950	0	227.556	0.351
378	311	1150	0	227.556	0.083	378	311	1150	0	227.556	0.351
379	311	1350	0	227.556	0.083	379	311	1350	0	227.556	0.351
380	311	1550	0	227.556	0.083	380	311	1550	0	227.556	0.351
381	311	1750	0	227.556	0.083	381	311	1750	0	227.556	0.351
382	311	1950	0	227.556	0.083	382	311	1950	0	227.556	0.351
383	311	2150	0	227.556	0.083	383	311	2150	0	227.556	0.351
384	311	2350	0	227.556	0.083	384	311	2350	0	227.556	0.351
385	312	150	0	227.556	0.083	385	312	150	0	227.556	0.351
386	312	350	0	227.556	0.083	386	312	350	0	227.556	0.351
387	312	550	0	227.556	0.083	387	312	550	0	227.556	0.351
388	312	750	0	227.556	0.083	388	312	750	0	227.556	0.351
389	312	950	0	227.556	0.083	389	312	950	0	227.556	0.351
390	312	1150	0	227.556	0.083	390	312	1150	0	227.556	0.351
391	312	1350	0	227.556	0.083	391	312	1350	0	227.556	0.351
392	312	1550	0	227.556	0.083	392	312	1550	0	227.556	0.351
393	312	1750	0	227.556	0.083	393	312	1750	0	227.556	0.351
394	312	1950	0	227.556	0.083	394	312	1950	0	227.556	0.351
395	312	2150	0	227.556	0.083	395	312	2150	0	227.556	0.351
396	312	2350	0	227.556	0.083	396	312	2350	0	227.556	0.351
397	313	150	0	227.556	0.083	397	313	150	0	227.556	0.351
398	313	350	0	227.556	0.083	398	313	350	0	227.556	0.351

(Continued)

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Table 4 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)
281	303	730	0	227.556	0.181	281	303	730	0	227.556	0.181
282	303	930	0	227.556	0.185	282	303	930	0	227.556	0.185
283	303	1130	0	227.556	0.140	283	303	1130	0	227.556	0.140
284	303	1330	0	227.556	1.184	284	303	1330	0	227.556	1.184
285	303	1530	0	227.556	1.436	285	303	1530	0	227.556	1.436
286	303	1730	0	227.556	0.971	286	303	1730	0	227.556	0.971
287	303	1930	16	227.556	0.804	287	303	1930	16	227.556	0.804
288	303	2130	0	227.556	0.819	288	303	2130	0	227.556	0.819
289	303	2330	0	227.556	0.745	289	303	2330	0	227.556	0.745
290	304	130	0	227.556	0.572	290	304	130	0	227.556	0.572
291	304	330	0	227.556	0.502	291	304	330	0	227.556	0.502
292	304	530	0	227.556	0.495	292	304	530	0	227.556	0.495
293	304	730	0	227.556	0.548	293	304	730	0	227.556	0.548
294	304	930	0	227.556	0.671	294	304	930	0	227.556	0.671
295	304	1130	1	227.556	0.735	295	304	1130	1	227.556	0.735
296	304	1330	0	227.556	0.699	296	304	1330	0	227.556	0.699
297	304	1530	0	227.556	0.685	297	304	1530	0	227.556	0.685
298	304	1730	0	227.556	0.592	298	304	1730	0	227.556	0.592
299	304	1930	0	227.556	0.551	299	304	1930	0	227.556	0.551
300	304	2130	0	227.556	0.556	300	304	2130	0	227.556	0.556
301	304	2330	0	227.556	0.448	301	304	2330	0	227.556	0.448
302	305	130	0	227.556	0.405	302	305	130	0	227.556	0.405
303	305	330	0	227.556	0.415	303	305	330	0	227.556	0.415
304	305	530	0	227.556	0.409	304	305	530	0	227.556	0.409
305	305	730	0	227.556	0.422	305	305	730	0	227.556	0.422
306	305	930	0	227.556	0.465	306	305	930	0	227.556	0.465
307	305	1130	0	227.556	0.589	307	305	1130	0	227.556	0.589
308	305	1330	0	227.556	0.684	308	305	1330	0	227.556	0.684
309	305	1530	0	227.556	0.819	309	305	1530	0	227.556	0.819
310	305	1730	0	227.556	0.788	310	305	1730	0	227.556	0.788
311	305	1930	0	227.556	0.703	311	305	1930	0	227.556	0.703
312	305	2130	0	227.556	0.637	312	305	2130	0	227.556	0.637
313	305	2330	0	227.556	0.567	313	305	2330	0	227.556	0.567
314	306	130	0	227.556	0.504	314	306	130	0	227.556	0.504
315	306	330	0	227.556	0.524	315	306	330	0	227.556	0.524
316	306	530	0	227.556	0.504	316	306	530	0	227.556	0.504
317	306	730	0	227.556	0.204	317	306	730	0	227.556	0.204
318	306	930	0	227.556	0.278	318	306	930	0	227.556	0.278
319	306	1130	0	227.556	0.387	319	306	1130	0	227.556	0.387
320	306	1330	0	227.556	0.461	320	306	1330	0	227.556	0.461
321	306	1530	0	227.556	0.566	321	306	1530	0	227.556	0.566
322	306	1730	0	227.556	0.579	322	306	1730	0	227.556	0.579
323	306	1930	0	227.556	0.581	323	306	1930	0	227.556	0.581
324	306	2130	6	227.556	0.443	324	306	2130	6	227.556	0.443
325	306	2330	0	227.556	0.579	325	306	2330	0	227.556	0.579
326	307	130	0	227.556	1.544	326	307	130	0	227.556	1.544
327	307	330	0	227.556	2.992	327	307	330	0	227.556	2.992
328	307	530	0	227.556	7.228	328	307	530	0	227.556	7.228
329	307	730	0	227.556	2.651	329	307	730	0	227.556	2.651
330	307	930	0	227.556	2.256	330	307	930	0	227.556	2.256
331	307	1130	0	227.556	1.797	331	307	1130	0	227.556	1.797
332	307	1330	0	227.556	1.510	332	307	1330	0	227.556	1.510
333	307	1530	0	227.556	1.375	333	307	1530	0	227.556	1.375
334	307	1730	0	227.556	1.479	334	307	1730	0	227.556	1.479
335	307	1930	0	227.556	1.098	335	307	1930	0	227.556	1.098
336	307	2130	0	227.556	0.915	336	307	2130	0	227.556	0.915
337	307	2330	0	227.556	0.844	337	307	2330	0	227.556	0.844
338	308	130	0	227.556	0.822	338	308	130	0	227.556	0.822
339	308	330	0	227.556	0.793	339	308	330	0	227.556	0.793
				227.556	0.639					227.556	0.639

(Continued)

Table 4 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)
222	298	930	0	4.819	0.825	222	298	930	144	0	0.
223	298	1130	0	5.007	0.723	223	298	1130	0	5.432	5.903
224	298	1330	0	5.473	0.548	224	298	1330	0	5.936	3.780
225	298	1530	0	5.007	0.360	225	298	1530	0	5.673	2.956
226	298	1730	0	4.055	0.390	226	298	1730	0	5.673	2.141
227	298	1930	0	4.188	0.262	227	298	1930	64	0.	0.
228	298	2130	0	3.931	0.199	228	298	2130	144	0.	0.
229	298	2330	0	4.055	0.317	229	298	2330	128	0.	0.
230	298	1330	0	3.814	0.341	230	298	1330	272	0.	0.
231	299	930	0	3.931	0.253	231	299	930	112	0.	0.
232	299	1130	0	227.556	0.124	232	299	1130	0	3.931	1.171
233	299	1330	0	227.556	0.133	233	299	1330	240	0.	0.
234	299	1530	0	227.556	0.096	234	299	1530	96	0.	0.
235	299	1730	0	227.556	0.187	235	299	1730	80	0.	0.
236	299	1930	0	227.556	0.141	236	299	1930	0	227.556	0.382
237	299	2130	0	227.556	0.261	237	299	2130	0	1.701	0.464
238	299	2330	0	227.556	0.261	238	299	2330	0	1.701	0.643
239	299	930	0	227.556	0.083	239	299	930	0	1.931	0.544
240	299	1130	0	227.556	0.081	240	299	1130	0	4.055	0.366
241	299	1330	0	227.556	0.089	241	299	1330	96	0.	0.
242	300	930	0	227.556	0.143	242	300	930	144	0.	0.
243	300	1130	0	227.556	0.095	243	300	1130	161	0.	0.
244	300	1330	0	227.556	0.173	244	300	1330	128	0.	0.
245	300	1530	0	4.330	0.454	245	300	1530	176	0.	0.
246	300	1730	0	4.819	0.477	246	300	1730	208	0.	0.
247	300	1930	0	227.556	0.444	247	300	1930	0	5.432	4.648
248	300	2130	0	227.556	0.352	248	300	2130	0	6.543	5.190
249	300	2330	0	5.007	0.301	249	300	2330	64	0.	0.
250	300	930	0	227.556	0.292	250	300	930	16	6.543	5.053
251	300	1130	0	4.644	0.228	251	300	1130	32	0.	0.
252	300	1330	0	5.007	0.256	252	300	1330	16	5.936	3.347
253	300	1530	0	227.556	0.278	253	300	1530	112	0.	0.
254	301	930	0	227.556	0.376	254	301	930	48	0.	0.
255	301	1130	0	5.211	0.518	255	301	1130	64	0.	0.
256	301	1330	0	5.007	0.394	256	301	1330	176	0.	0.
257	301	1530	0	4.330	0.340	257	301	1530	80	0.	0.
258	301	1730	0	4.055	0.307	258	301	1730	33	0.	0.
259	301	1930	0	4.188	0.443	259	301	1930	16	6.055	2.605
260	301	2130	0	227.556	0.468	260	301	2130	0	5.673	3.873
261	301	2330	0	227.556	0.388	261	301	2330	64	0.	0.
262	302	930	0	227.556	0.230	262	302	930	0	6.543	1.045
263	302	1130	0	227.556	0.260	263	302	1130	0	5.188	2.833
264	302	1330	0	227.556	0.208	264	302	1330	0	7.288	1.903
265	302	1530	0	4.481	0.141	265	302	1530	0	1.228	1.610
266	302	1730	0	4.188	0.152	266	302	1730	0	1.931	1.192
267	302	1930	0	227.556	0.128	267	302	1930	0	5.673	0.864
268	302	2130	0	227.556	0.094	268	302	2130	32	0.	0.
269	302	2330	0	227.556	0.065	269	302	2330	0	4.481	0.513
270	302	930	0	227.556	0.103	270	302	930	0	227.556	0.513
271	302	1130	0	227.556	0.063	271	302	1130	0	227.556	0.337
272	302	1330	0	227.556	0.135	272	302	1330	0	227.556	0.265
273	302	1530	0	227.556	0.078	273	302	1530	0	227.556	0.267
274	302	1730	0	227.556	0.038	274	302	1730	32	0.	0.
275	302	1930	0	227.556	0.049	275	302	1930	0	5.432	0.183
276	302	2130	0	227.556	0.049	276	302	2130	0	227.556	0.200
277	302	2330	0	227.556	0.049	277	302	2330	0	227.556	0.200
278	303	930	0	227.556	0.049	278	303	930	0	227.556	0.200
279	303	1130	0	227.556	0.049	279	303	1130	0	227.556	0.200
280	303	1330	0	227.556	0.049	280	303	1330	0	227.556	0.200

(Continued)

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Table 4 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)
163	293	1130	0	227.556	0.471	163	293	1130	0	227.556	0.471
164	293	1330	0	227.556	0.553	164	293	1330	0	227.556	0.553
165	293	1530	0	227.556	0.427	165	293	1530	0	6.225	0.427
166	293	1730	0	227.556	0.356	166	293	1730	0	6.896	0.356
167	293	1930	0	227.556	0.330	167	293	1930	0	6.543	0.330
168	293	2130	0	227.556	0.357	168	293	2130	0	227.556	0.357
169	293	2330	96	0	0	169	293	2330	96	0	0
170	294	130	106	0	0	170	294	130	106	0	0
171	294	330	0	227.556	0.326	171	294	330	0	5.936	0.326
172	294	530	0	227.556	0.400	172	294	530	0	4.055	0.400
173	294	730	0	227.556	0.417	173	294	730	0	4.330	0.417
174	294	930	0	227.556	0.476	174	294	930	0	227.556	0.476
175	294	1130	0	227.556	0.418	175	294	1130	0	4.819	0.418
176	294	1330	0	227.556	0.440	176	294	1330	0	4.481	0.440
177	294	1530	0	227.556	0.526	177	294	1530	0	3.931	0.526
178	294	1730	0	227.556	0.719	178	294	1730	0	6.243	0.719
179	294	1930	0	227.556	0.771	179	294	1930	0	4.644	0.771
180	294	2130	0	227.556	0.611	180	294	2130	0	4.510	0.611
181	294	2330	0	227.556	0.523	181	294	2330	0	3.703	0.523
182	295	130	0	227.556	0.250	182	295	130	0	227.556	0.250
183	295	330	0	227.556	0.327	183	295	330	0	227.556	0.327
184	295	530	0	227.556	0.683	184	295	530	0	3.007	0.683
185	295	730	0	227.556	0.755	185	295	730	0	4.819	0.755
186	295	930	0	227.556	0.733	186	295	930	0	4.481	0.733
187	295	1130	0	227.556	0.560	187	295	1130	0	4.055	0.560
188	295	1330	0	227.556	0.443	188	295	1330	0	4.644	0.443
189	295	1530	0	227.556	0.361	189	295	1530	0	4.819	0.361
190	295	1730	0	227.556	0.363	190	295	1730	0	227.556	0.363
191	295	1930	0	227.556	0.444	191	295	1930	0	4.644	0.444
192	295	2130	0	227.556	0.406	192	295	2130	0	5.432	0.406
193	295	2330	0	227.556	0.488	193	295	2330	0	6.225	0.488
194	296	130	0	227.556	0.437	194	296	130	0	6.225	0.437
195	296	330	1	227.556	0.563	195	296	330	1	6.896	0.563
196	296	530	0	227.556	0.622	196	296	530	0	6.896	0.622
197	296	730	0	227.556	0.620	197	296	730	0	6.543	0.620
198	296	930	0	227.556	0.580	198	296	930	0	6.543	0.580
199	296	1130	0	227.556	0.588	199	296	1130	0	6.896	0.588
200	296	1330	0	227.556	0.584	200	296	1330	0	6.896	0.584
201	296	1530	0	227.556	0.565	201	296	1530	0	6.896	0.565
202	296	1730	0	227.556	0.527	202	296	1730	0	3.814	0.527
203	296	1930	0	227.556	0.535	203	296	1930	0	6.543	0.535
204	296	2130	0	227.556	0.511	204	296	2130	0	6.543	0.511
205	296	2330	14	227.556	1.280	205	296	2330	14	81.920	1.280
206	297	130	0	227.556	0.366	206	297	130	0	3.814	0.366
207	297	330	176	0	0	207	297	330	176	0	0
208	297	530	304	0	0	208	297	530	304	0	0
209	297	730	0	227.556	0.215	209	297	730	0	7.288	0.215
210	297	930	0	227.556	0.230	210	297	930	0	6.896	0.230
211	297	1130	0	227.556	0.225	211	297	1130	0	6.225	0.225
212	297	1330	0	227.556	0.201	212	297	1330	0	227.556	0.201
213	297	1530	0	227.556	0.196	213	297	1530	0	6.896	0.196
214	297	1730	0	227.556	0.213	214	297	1730	0	227.556	0.213
215	297	1930	0	227.556	0.175	215	297	1930	0	3.814	0.175
216	297	2130	96	0	0	216	297	2130	96	0	0
217	297	2330	0	227.556	0.194	217	297	2330	0	227.556	0.194
218	298	130	0	227.556	0.209	218	298	130	0	5.936	0.209
219	298	330	0	227.556	0.203	219	298	330	0	3.703	0.203
220	298	530	0	227.556	0.602	220	298	530	0	3.703	0.602
221	298	730	80	0	0	221	298	730	80	0	0

(Continued)

Table 4 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)
134	238	1330	0	227.556	0.064	104	288	1330	0	4.441	0.620
135	238	1330	0	227.556	0.084	105	288	1330	0	4.055	0.602
136	238	1330	0	227.556	0.085	106	288	1330	0	4.644	0.714
137	268	1930	0	227.556	0.147	107	288	1930	0	4.188	0.734
138	268	1930	0	227.556	0.136	108	288	1930	0	5.007	1.052
139	268	2330	0	227.556	0.155	109	288	2330	0	3.814	1.633
140	268	2330	0	227.556	0.150	110	289	1330	1	4.819	1.725
141	289	330	0	227.556	0.146	111	289	330	0	5.007	1.943
142	289	530	0	227.556	0.174	112	289	530	0	4.819	1.507
143	289	730	0	227.556	0.158	113	289	730	0	3.703	1.219
144	289	930	19	6.055	0.639	114	289	930	0	5.432	1.643
145	289	1130	0	6.819	0.190	115	289	1130	2	4.188	2.268
146	289	1330	0	227.556	0.237	116	289	1330	0	4.330	2.458
147	289	1530	0	6.330	0.208	117	289	1530	0	5.673	2.657
148	289	1730	0	6.819	0.193	118	289	1730	0	4.055	2.487
149	289	1930	0	227.556	0.250	119	289	1930	0	3.703	1.740
150	289	2130	0	3.931	0.214	120	289	2130	0	3.703	1.657
151	289	2330	0	4.819	0.767	121	289	2330	0	5.432	3.361
152	290	1330	0	4.819	0.707	122	290	1330	0	5.007	3.164
153	290	330	0	4.644	0.675	123	290	330	0	5.432	3.220
154	290	530	0	4.819	0.620	124	290	530	0	5.211	3.042
155	290	730	0	4.819	0.592	125	290	730	0	5.007	2.945
156	290	930	0	4.330	0.330	126	290	930	0	4.330	1.479
157	290	1130	0	227.556	0.255	127	290	1130	0	3.703	0.933
158	290	1330	0	227.556	0.142	128	290	1330	0	3.703	0.842
159	290	1530	0	227.556	0.118	129	290	1530	0	3.911	0.555
160	290	1730	0	227.556	0.216	130	290	1730	0	3.911	0.555
161	290	1930	0	227.556	0.051	131	290	1930	0	3.911	0.868
162	290	2130	0	227.556	0.072	132	290	2130	0	3.703	0.318
163	290	2330	0	227.556	0.054	133	290	2330	1	3.703	0.185
164	291	130	0	227.556	0.075	134	291	130	0	227.556	0.267
165	291	330	0	227.556	0.069	135	291	330	0	227.556	0.267
166	291	530	0	227.556	0.090	136	291	530	0	227.556	0.267
167	291	730	0	227.556	0.132	137	291	730	0	227.556	0.267
168	291	930	0	227.556	0.077	138	291	930	0	227.556	0.267
169	291	1130	0	227.556	0.200	139	291	1130	0	227.556	0.185
170	291	1330	0	227.556	0.074	140	291	1330	2	227.556	0.163
171	291	1530	0	227.556	0.046	141	291	1530	0	227.556	0.153
172	291	1730	0	227.556	0.071	142	291	1730	0	227.556	0.094
173	291	1930	0	227.556	0.096	143	291	1930	0	227.556	0.089
174	291	2130	0	227.556	0.070	144	291	2130	0	227.556	0.233
175	291	2330	0	227.556	0.042	145	291	2330	0	227.556	0.221
176	292	130	0	227.556	0.143	146	292	130	0	227.556	0.130
177	292	330	0	227.556	0.072	147	292	330	0	227.556	0.232
178	292	530	0	227.556	0.101	148	292	530	0	4.188	0.191
179	292	730	0	227.556	0.049	149	292	730	114	227.556	0.217
180	292	930	0	227.556	0.083	150	292	930	0	227.556	0.238
181	292	1130	0	227.556	0.083	151	292	1130	0	227.556	0.263
182	292	1330	0	227.556	0.036	152	292	1330	0	227.556	0.269
183	292	1530	0	227.556	0.037	153	292	1530	176	227.556	0.269
184	292	1730	0	227.556	0.037	154	292	1730	37	227.556	0.269
185	292	1930	0	227.556	0.036	155	292	1930	0	227.556	0.449
186	292	2130	0	227.556	0.039	156	292	2130	0	4.055	0.351
187	292	2330	0	227.556	0.059	157	292	2330	0	5.673	0.319
188	293	130	0	227.556	0.084	158	293	130	0	227.556	0.265
189	293	330	0	227.556	0.094	159	293	330	1	227.556	0.294
190	293	530	0	227.556	0.145	160	293	530	0	227.556	0.323
191	293	730	0	227.556	0.093	161	293	730	0	227.556	0.382
192	293	930	0	227.556	0.103	162	293	930	0	227.556	0.402

(Continued)

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Table 4 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	SIG. PER. (SEC.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	SIG. PER. (SEC.)	SIG. HT. (FT.)	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)
45	283	1530	227.556	0.070	45	283	1530	227.556	0.458	0	4.819	0.458
46	283	1730	227.556	0.049	46	283	1730	227.556	0.350	0	4.350	0.350
47	283	1930	227.556	0.064	47	283	1930	227.556	0.381	5	5.007	0.381
48	283	2130	227.556	0.132	48	283	2130	227.556	0.468	0	4.168	0.468
49	283	2330	227.556	0.051	49	283	2330	227.556	0.651	0	4.644	0.651
50	284	130	227.556	0.089	50	284	130	227.556	1.112	0	4.168	1.112
51	284	330	227.556	0.131	51	284	330	227.556	1.025	0	3.931	1.025
52	284	530	227.556	0.131	52	284	530	227.556	0.861	11	4.644	0.861
53	284	730	227.556	0.114	53	284	730	227.556	1.187	12	5.211	1.187
54	284	930	227.556	0.117	54	284	930	227.556	1.479	0	5.432	1.479
55	284	1130	227.556	0.119	55	284	1130	227.556	2.256	14	5.211	2.256
56	284	1330	227.556	0.136	56	284	1330	227.556	1.627	0	5.432	1.627
57	284	1530	227.556	0.216	57	284	1530	227.556	1.823	0	5.936	1.823
58	284	1730	227.556	0.146	58	284	1730	227.556	2.484	1	4.481	2.484
59	284	1930	227.556	0.146	59	284	1930	227.556	1.839	1	5.432	1.839
60	284	2130	227.556	0.176	60	284	2130	227.556	1.583	3	5.073	1.583
61	284	2330	227.556	0.136	61	284	2330	227.556	1.530	0	5.073	1.530
62	285	130	227.556	0.176	62	285	130	227.556	1.900	0	5.211	1.900
63	285	330	227.556	0.165	63	285	330	227.556	2.001	0	5.936	2.001
64	285	530	227.556	0.210	64	285	530	227.556	1.909	0	5.432	1.909
65	285	730	227.556	0.192	65	285	730	227.556	1.845	2	6.225	1.845
66	285	930	227.556	0.279	66	285	930	227.556	2.221	0	5.936	2.221
67	285	1130	227.556	0.857	67	285	1130	227.556	2.225	0	6.225	2.225
68	285	1330	227.556	0.799	68	285	1330	227.556	3.481	4	4.644	3.481
69	285	1530	227.556	0.653	69	285	1530	227.556	3.721	0	5.673	3.721
70	285	1730	227.556	0.463	70	285	1730	227.556	3.025	0	5.432	3.025
71	285	1930	227.556	0.323	71	285	1930	227.556	2.565	16	5.211	2.565
72	285	2130	227.556	0.555	72	285	2130	227.556	2.462	0	5.432	2.462
73	285	2330	227.556	0.428	73	285	2330	227.556	2.462	0	5.211	2.462
74	286	130	227.556	0.437	74	286	130	227.556	2.054	0	4.819	2.054
75	286	330	227.556	0.133	75	286	330	227.556	4.055	13	3.703	4.055
76	286	530	227.556	0.271	76	286	530	227.556	1.026	0	4.055	1.026
77	286	730	227.556	0.453	77	286	730	227.556	0.522	0	227.556	0.522
78	286	930	227.556	0.208	78	286	930	227.556	0.433	0	227.556	0.433
79	286	1130	227.556	0.303	79	286	1130	227.556	0.542	0	227.556	0.542
80	286	1330	227.556	0.206	80	286	1330	227.556	0.849	4	3.703	0.849
81	286	1530	227.556	0.214	81	286	1530	227.556	1.183	0	3.414	1.183
82	286	1730	227.556	0.239	82	286	1730	227.556	0.993	0	5.614	0.993
83	286	1930	227.556	0.149	83	286	1930	227.556	0.978	4	3.703	0.978
84	286	2130	227.556	0.594	84	286	2130	227.556	0.924	2	3.703	0.924
85	286	2330	227.556	0.854	85	286	2330	227.556	2.169	0	3.931	2.169
86	287	130	227.556	0.854	86	287	130	227.556	4.162	0	5.211	4.162
87	287	330	227.556	0.854	87	287	330	227.556	4.485	0	5.432	4.485
88	287	530	227.556	0.854	88	287	530	227.556	6.362	1	6.225	6.362
89	287	730	227.556	0.632	89	287	730	227.556	7.492	5	6.896	7.492
90	287	930	227.556	0.468	90	287	930	227.556	8.271	0	6.543	8.271
91	287	1130	227.556	1.177	91	287	1130	227.556	8.280	0	7.288	8.280
92	287	1330	227.556	1.262	92	287	1330	227.556	8.280	0	5.673	8.280
93	287	1530	227.556	1.235	93	287	1530	227.556	7.061	0	5.673	7.061
94	287	1730	227.556	0.998	94	287	1730	227.556	6.420	0	4.225	6.420
95	287	1930	227.556	0.700	95	287	1930	227.556	6.937	0	4.225	6.937
96	287	2130	227.556	0.535	96	287	2130	227.556	5.953	0	5.953	5.953
97	287	2330	227.556	0.364	97	287	2330	227.556	5.432	0	5.432	5.432
98	288	130	227.556	0.198	98	288	130	227.556	2.637	0	4.819	2.637
99	288	330	227.556	0.232	99	288	330	227.556	2.382	0	3.007	2.382
100	288	530	227.556	0.251	100	288	530	227.556	1.778	0	4.644	1.778
101	288	730	227.556	0.087	101	288	730	227.556	1.239	0	4.350	1.239
102	288	930	227.556	0.260	102	288	930	227.556	0.869	0	5.007	0.869
103	288	1130	227.556	0.260	103	288	1130	227.556	0.596	4	4.461	0.596

(Continued)

(Sheet 2 of 13)

Table 4

## Wave Data Record Summary

## Ludington Harbor, Michigan

a. Gage 7; Ludington Harbor Channel  
6 October 1983 - 6 December 1983  
Data Recovery Rate: 98.8%

b. Gage 67; Lake Michigan Site  
6 October 1983 - 8 December 1983  
Data Recovery Rate: 90.8%

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)
1	279	2330	38	0.	0.	1	279	2330	0	0.	0.
2	280	130	32	0.	0.	2	280	130	0	0.	0.
3	280	130	34	0.	0.	3	280	130	0	0.	0.
4	280	530	55	0.	0.	4	280	530	10	0.	0.
5	280	730	43	0.	0.	5	280	730	1	0.	0.
6	280	930	32	0.	0.	6	280	930	0	0.	0.
7	280	1130	0	227.556	0.136	7	280	1130	0	3.814	0.561
8	280	1330	0	227.556	0.194	8	280	1330	0	227.556	0.574
9	280	1530	0	5.007	0.246	9	280	1530	1	5.211	3.795
10	280	1730	16	5.007	0.300	10	280	1730	0	5.211	3.795
11	280	1930	0	227.556	0.370	11	280	1930	0	7.284	3.202
12	280	2130	0	227.556	0.209	12	280	2130	0	6.896	2.049
13	280	2330	0	227.556	0.314	13	280	2330	11	5.632	1.610
14	281	130	0	227.556	0.243	14	281	130	14	0.	0.
15	281	330	0	227.556	0.127	15	281	330	11	0.	0.
16	281	530	0	227.556	0.268	16	281	530	0	3.703	1.900
17	281	730	0	227.556	0.355	17	281	730	5	5.007	2.722
18	281	930	0	227.556	0.182	18	281	930	9	6.543	3.231
19	281	1130	0	4.188	0.130	19	281	1130	0	7.284	2.650
20	281	1330	0	227.556	0.169	20	281	1330	7	6.896	1.823
21	281	1530	0	227.556	0.191	21	281	1530	10	3.931	1.359
22	281	1730	0	227.556	0.096	22	281	1730	1	3.814	2.930
23	281	1930	0	4.188	0.060	23	281	1930	8	3.703	3.690
24	281	2130	0	227.556	0.074	24	281	2130	16	3.203	3.139
25	281	2330	0	227.556	0.055	25	281	2330	0	3.931	0.476
26	282	130	0	227.556	0.209	26	282	130	0	3.814	0.397
27	282	330	0	227.556	0.047	27	282	330	0	4.461	0.469
28	282	530	0	227.556	0.043	28	282	530	0	5.007	0.503
29	282	730	0	227.556	0.043	29	282	730	0	7.284	0.357
30	282	930	0	227.556	0.041	30	282	930	10	7.284	0.198
31	282	1130	21	0.	0.	31	282	1130	0	227.556	0.197
32	282	1330	0	227.556	0.071	32	282	1330	0	6.225	0.280
33	282	1530	0	227.556	0.075	33	282	1530	0	6.225	0.280
34	282	1730	0	227.556	0.083	34	282	1730	0	6.896	1.347
35	282	1930	0	227.556	0.083	35	282	1930	2	3.814	0.258
36	282	2130	0	227.556	0.080	36	282	2130	0	3.814	0.250
37	282	2330	0	227.556	0.014	37	282	2330	0	3.703	0.342
38	283	130	0	227.556	0.027	38	283	130	0	3.703	0.275
39	283	330	0	227.556	0.047	39	283	330	1	227.556	0.276
40	283	530	0	227.556	0.049	40	283	530	4	3.703	0.299
41	283	730	0	227.556	0.071	41	283	730	0	3.703	0.360
42	283	930	0	227.556	0.106	42	283	930	0	4.055	0.388
43	283	1130	0	227.556	0.078	43	283	1130	0	4.055	0.382
44	283	1330	0	227.556	0.049	44	283	1330	0	3.931	0.594
45	283	1530	0	227.556	0.102	45	283	1530	0	4.350	0.492

(Continued)

(Sheet 1 of 13)

Table 3 (Concluded)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)
615	275	2200	0	227.556	0.173	615	275	2200	0	0.	0.
616	275	2400	0	227.556	0.235	616	275	2400	0	0.	0.
617	276	200	0	227.556	0.265	617	276	200	0	0.	0.
618	276	400	0	227.556	0.277	618	276	400	0	0.	0.
619	276	600	0	227.556	0.292	619	276	600	0	0.	0.
620	276	800	0	227.556	0.298	620	276	800	0	0.	0.
621	276	1000	0	227.556	0.269	621	276	1000	0	0.	0.
622	276	1200	0	227.556	0.222	622	276	1200	0	0.	0.
623	276	1400	0	227.556	0.380	623	276	1400	0	0.	0.
624	276	1600	0	227.556	0.298	624	276	1600	0	0.	0.
625	276	1800	0	227.556	0.344	625	276	1800	0	0.	0.
626	276	2000	0	227.556	0.183	626	276	2000	0	0.	0.
627	276	2200	0	227.556	0.184	627	276	2200	0	0.	0.
628	277	200	0	227.556	0.228	628	277	200	0	0.	0.
629	277	400	0	227.556	0.228	629	277	400	0	0.	0.
630	277	600	0	227.556	0.140	630	277	600	0	0.	0.
631	277	800	0	227.556	0.208	631	277	800	0	0.	0.
632	277	1000	0	227.556	0.414	632	277	1000	0	0.	0.
633	277	1200	0	0.	0.	633	277	1200	0	0.	0.
634	277	1400	609	0.	0.	634	277	1400	0	0.	0.
635	277	1600	0	0.	0.	635	277	1600	0	0.	0.

Table 3 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	SIG. PER. (SEC.)	SIG. MT. (FT.)	BAO POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)
574	271	2400	227.556	0.114	21	227.556	0.114
575	271	2400	227.556	0.025	41	227.556	0.025
576	271	2400	227.556	0.086	12	227.556	0.086
577	271	2400	227.556	0.203	11	227.556	0.203
578	271	2400	227.556	0.019	42	227.556	0.019
579	271	2400	227.556	0.061	1000	227.556	0.061
580	271	2400	227.556	0.076	1000	227.556	0.076
581	271	2400	227.556	0.042	1000	227.556	0.042
582	271	2400	227.556	0.045	1000	227.556	0.045
583	271	2400	227.556	0.035	1000	227.556	0.035
584	271	2400	227.556	0.045	1000	227.556	0.045
585	271	2400	227.556	0.045	1000	227.556	0.045
586	271	2400	227.556	0.029	1000	227.556	0.029
587	271	2400	227.556	0.095	1000	227.556	0.095
588	271	2400	227.556	0.048	1000	227.556	0.048
589	271	2400	227.556	0.025	1000	227.556	0.025
590	271	2400	227.556	0.126	1000	227.556	0.126
591	271	2400	227.556	0.091	1000	227.556	0.091
592	271	2400	227.556	0.022	1000	227.556	0.022
593	271	2400	227.556	0.061	1000	227.556	0.061
594	271	2400	227.556	0.048	1000	227.556	0.048
595	271	2400	227.556	0.075	1000	227.556	0.075
596	271	2400	227.556	0.043	1000	227.556	0.043
597	271	2400	227.556	0.038	1000	227.556	0.038
598	271	2400	227.556	0.023	1000	227.556	0.023
599	271	2400	227.556	0.044	1000	227.556	0.044
600	271	2400	227.556	0.045	1000	227.556	0.045
601	271	2400	227.556	0.038	1000	227.556	0.038
602	271	2400	227.556	0.028	1000	227.556	0.028
603	271	2400	227.556	0.035	1000	227.556	0.035
604	271	2400	227.556	0.044	1000	227.556	0.044
605	271	2400	227.556	0.033	1000	227.556	0.033
606	271	2400	227.556	0.096	1000	227.556	0.096
607	271	2400	227.556	0.065	1000	227.556	0.065
608	271	2400	227.556	0.062	1000	227.556	0.062
609	271	2400	227.556	0.089	1000	227.556	0.089
610	271	2400	227.556	0.059	1000	227.556	0.059
611	271	2400	227.556	0.035	1000	227.556	0.035
612	271	2400	227.556	0.061	1000	227.556	0.061
613	271	2400	227.556	0.052	1000	227.556	0.052
614	271	2400	227.556	0.042	1000	227.556	0.042
615	271	2400	227.556	0.033	1000	227.556	0.033
616	271	2400	227.556	0.102	1000	227.556	0.102
617	271	2400	227.556	0.036	1000	227.556	0.036
618	271	2400	227.556	0.088	1000	227.556	0.088
619	271	2400	227.556	0.148	1000	227.556	0.148
620	271	2400	227.556	0.061	1000	227.556	0.061
621	271	2400	227.556	0.061	1000	227.556	0.061
622	271	2400	227.556	0.054	1000	227.556	0.054
623	271	2400	227.556	0.098	1000	227.556	0.098
624	271	2400	227.556	0.062	1000	227.556	0.062
625	271	2400	227.556	0.120	1000	227.556	0.120
626	271	2400	227.556	0.075	1000	227.556	0.075
627	271	2400	227.556	0.135	1000	227.556	0.135
628	271	2400	227.556	0.133	1000	227.556	0.133
629	271	2400	227.556	0.100	1000	227.556	0.100
630	271	2400	227.556	0.157	1000	227.556	0.157
631	271	2400	227.556	0.207	1000	227.556	0.207
632	271	2400	227.556	0.175	1000	227.556	0.175
633	271	2400	227.556	0.192	1000	227.556	0.192
634	271	2400	227.556	0.192	1000	227.556	0.192

(Continued)

Table 3 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)
517	266	210	0	4.155	0.195	517	266	200	0	0.	0.
518	266	400	0	4.188	0.387	518	266	400	0	0.	0.
519	266	600	0	4.188	0.505	519	266	600	0	0.	0.
520	266	800	0	4.055	0.461	520	266	800	0	5.311	2.104
521	266	1000	0	4.188	0.458	521	266	1000	53	0.	0.
522	266	1200	0	4.055	0.533	522	266	1200	24	0.	0.
523	266	1400	0	3.931	0.223	523	266	1400	0	4.184	1.703
524	266	1600	0	3.931	0.125	524	266	1600	0	4.055	0.551
525	266	1800	0	227.555	0.070	525	266	1800	0	3.703	0.460
526	266	2000	0	227.555	0.053	526	266	2000	0	227.555	0.266
527	266	2200	0	227.555	0.082	527	266	2200	0	227.555	0.266
528	266	2400	0	3.814	0.101	528	266	2400	0	3.814	1.342
529	267	200	0	4.055	0.385	529	267	200	0	0.	0.
530	267	400	0	4.188	0.350	530	267	400	38	0.	0.
531	267	600	0	4.055	0.326	531	267	600	26	0.	0.
532	267	800	0	5.007	0.309	532	267	800	0	4.544	2.237
533	267	1000	0	5.007	0.149	533	267	1000	17	3.703	3.544
534	267	1200	0	5.007	0.371	534	267	1200	18	5.455	5.446
535	267	1400	0	4.812	0.354	535	267	1400	0	0.	0.
536	267	1600	0	4.812	0.251	536	267	1600	46	0.	0.
537	267	1800	0	5.007	0.254	537	267	1800	34	0.	0.
538	267	2000	0	227.555	0.215	538	267	2000	0	6.496	3.903
539	267	2200	0	227.555	0.215	539	267	2200	33	0.	0.
540	267	2400	0	227.555	0.210	540	267	2400	32	0.	0.
541	268	200	0	5.007	0.217	541	268	200	1	6.496	5.007
542	268	400	0	5.007	0.346	542	268	400	44	0.	0.
543	268	600	0	5.007	0.355	543	268	600	38	0.	0.
544	268	800	0	5.007	0.274	544	268	800	0	6.225	3.516
545	268	1000	0	5.007	0.303	545	268	1000	44	0.	0.
546	268	1200	0	5.017	0.313	546	268	1200	33	0.	0.
547	268	1400	0	5.007	0.312	547	268	1400	33	5.455	5.455
548	268	1600	0	4.812	0.300	548	268	1600	42	0.	0.
549	268	1800	0	5.007	0.324	549	268	1800	42	0.	0.
550	268	2000	0	5.007	0.244	550	268	2000	1	4.844	2.454
551	268	2200	0	227.555	0.296	551	268	2200	45	0.	0.
552	268	2400	0	4.155	0.171	552	268	2400	57	0.	0.
553	269	200	0	227.555	0.149	553	269	200	0	5.473	1.553
554	269	400	0	4.055	0.163	554	269	400	46	0.	0.
555	269	600	0	227.555	0.125	555	269	600	0	4.481	0.951
556	269	800	0	227.555	0.094	556	269	800	48	0.	0.
557	269	1000	0	227.555	0.116	557	269	1000	50	0.	0.
558	269	1200	0	227.555	0.128	558	269	1200	50	0.	0.
559	269	1400	0	4.055	0.140	559	269	1400	0	5.474	0.669
560	269	1600	0	227.555	0.152	560	269	1600	46	0.	0.
561	269	1800	0	227.555	0.169	561	269	1800	46	0.	0.
562	269	2000	0	227.555	0.157	562	269	2000	0	4.055	1.300
563	269	2200	0	227.555	0.116	563	269	2200	47	0.	0.
564	269	2400	0	227.555	0.136	564	269	2400	44	0.	0.
565	270	200	0	227.555	0.095	565	270	200	1	3.703	0.657
566	270	400	0	227.555	0.141	566	270	400	46	0.	0.
567	270	600	0	227.555	0.200	567	270	600	48	0.	0.
568	270	800	0	227.555	0.037	568	270	800	0	3.814	0.243
569	270	1000	0	227.555	0.079	569	270	1000	43	0.	0.
570	270	1200	0	227.555	0.101	570	270	1200	48	0.	0.
571	270	1400	0	227.555	0.023	571	270	1400	35	5.455	0.129
572	270	1600	0	227.555	0.030	572	270	1600	35	0.	0.
573	270	1800	0	227.555	0.031	573	270	1800	21	0.	0.
574	270	2000	0	227.555	0.065	574	270	2000	29	0.	0.
575	270	2200	0	227.555	0.109	575	270	2200	34	0.	0.

(Continued)

(Sheet 10 of 12)

Table 3 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)
454	261	471	0	227.556	0.521	458	261	471	17	31	0
455	261	602	0	227.556	0.434	459	261	600	0	0	0
456	261	800	0	227.556	0.334	460	261	800	16	0	0
457	261	1000	0	227.556	0.428	461	261	1000	0	0	0
458	261	1200	0	227.556	0.253	462	261	1200	0	0	0
459	261	1400	0	227.556	1.240	463	261	1400	16	0	0
460	261	1600	0	227.556	0.257	464	261	1600	0	0	0
461	261	1800	0	227.556	0.228	465	261	1800	0	0	0
462	261	2000	0	227.556	0.251	466	261	2000	0	0	0
463	261	2200	0	227.556	0.297	467	261	2200	0	0	0
464	261	2400	0	227.556	0.506	468	261	2400	0	0	0
465	261	2600	0	227.556	0.291	469	261	2600	0	0	0
466	261	2800	0	227.556	0.327	470	261	2800	0	0	0
467	261	3000	0	227.556	0.309	471	261	3000	0	0	0
468	261	3200	0	227.556	0.291	472	261	3200	0	0	0
469	261	3400	0	227.556	0.162	473	261	3400	0	0	0
470	261	3600	0	227.556	0.217	474	261	3600	0	0	0
471	261	3800	0	227.556	0.357	475	261	3800	0	0	0
472	261	4000	0	227.556	0.181	476	261	4000	0	0	0
473	261	4200	0	227.556	0.191	477	261	4200	0	0	0
474	261	4400	0	227.556	0.212	478	261	4400	0	0	0
475	261	4600	0	227.556	0.273	479	261	4600	0	0	0
476	261	4800	0	227.556	0.207	480	261	4800	0	0	0
477	261	5000	0	227.556	0.185	481	261	5000	2	31	0
478	261	5200	0	227.556	0.289	482	261	5200	0	0	0
479	261	5400	0	227.556	0.234	483	261	5400	0	0	0
480	261	5600	0	227.556	0.284	484	261	5600	0	0	0
481	261	5800	0	227.556	0.269	485	261	5800	0	0	0
482	261	6000	0	227.556	0.314	486	261	6000	0	0	0
483	261	6200	0	227.556	0.581	487	261	6200	16	0	0
484	261	6400	0	227.556	0.660	488	261	6400	0	0	0
485	261	6600	0	227.556	0.599	489	261	6600	0	0	0
486	261	6800	0	227.556	0.474	490	261	6800	0	0	0
487	261	7000	0	227.556	0.610	491	261	7000	0	0	0
488	261	7200	0	227.556	0.789	492	261	7200	0	0	0
489	261	7400	0	227.556	1.145	493	261	7400	0	0	0
490	261	7600	0	227.556	0.764	494	261	7600	0	0	0
491	261	7800	0	227.556	0.801	495	261	7800	0	0	0
492	261	8000	0	227.556	0.626	496	261	8000	0	0	0
493	261	8200	0	227.556	0.653	497	261	8200	0	0	0
494	261	8400	0	227.556	0.741	498	261	8400	0	0	0
495	261	8600	0	227.556	0.807	499	261	8600	0	0	0
496	261	8800	0	227.556	1.146	500	261	8800	0	0	0
497	261	9000	0	227.556	1.160	501	261	9000	0	0	0
498	261	9200	0	227.556	0.801	502	261	9200	0	0	0
499	261	9400	0	227.556	1.185	503	261	9400	0	0	0
500	261	9600	0	227.556	0.913	504	261	9600	0	0	0
501	261	9800	0	227.556	0.973	505	261	9800	0	0	0
502	261	10000	0	227.556	0.746	506	261	10000	0	0	0
503	261	10200	0	227.556	0.723	507	261	10200	0	0	0
504	261	10400	0	227.556	0.667	508	261	10400	0	0	0
505	261	10600	0	227.556	0.646	509	261	10600	0	0	0
506	261	10800	0	227.556	0.931	510	261	10800	0	0	0
507	261	11000	0	227.556	0.962	511	261	11000	0	0	0
508	261	11200	0	227.556	0.947	512	261	11200	0	0	0
509	261	11400	0	227.556	0.924	513	261	11400	0	0	0
510	261	11600	0	227.556	1.001	514	261	11600	0	0	0
511	261	11800	0	227.556	0.819	515	261	11800	0	0	0
512	261	12000	0	227.556	0.494	516	261	12000	0	0	0

(Continued)

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Tabl 4 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. HT. (FT.)
576	327	2130	0	227.556	0.716	576	327	2130	0	227.556	0.716
577	327	2330	0	227.556	0.502	577	327	2330	352	3.911	1.330
578	328	130	0	227.556	0.455	578	328	130	682	0.	0.
579	328	330	0	227.556	0.455	579	328	330	0	0.	0.
580	328	530	0	227.556	0.455	580	328	530	0	7.288	5.494
581	328	730	1	227.556	0.455	581	328	730	0	8.225	8.194
582	328	930	0	227.556	0.455	582	328	930	1	8.225	6.536
583	328	1130	0	227.556	0.455	583	328	1130	1	7.288	4.387
584	328	1330	0	227.556	0.455	584	328	1330	0	5.936	4.872
585	328	1530	0	227.556	0.455	585	328	1530	0	7.288	4.259
586	328	1730	0	227.556	0.455	586	328	1730	1	7.288	4.384
587	328	1930	0	227.556	0.455	587	328	1930	0	7.288	4.516
588	328	2130	0	227.556	0.455	588	328	2130	0	6.541	3.939
589	328	2330	0	227.556	0.455	589	328	2330	0	5.936	4.026
590	329	130	0	227.556	0.455	590	329	130	0	6.225	4.205
591	329	330	0	227.556	0.455	591	329	330	0	5.936	4.183
592	329	530	0	227.556	0.455	592	329	530	0	6.225	4.139
593	329	730	0	227.556	0.455	593	329	730	1	5.936	3.319
594	329	930	0	227.556	0.455	594	329	930	0	5.936	3.049
595	329	1130	0	227.556	0.455	595	329	1130	921	0.	0.
596	329	1330	0	227.556	0.455	596	329	1330	128	0.	0.
597	329	1530	0	227.556	0.455	597	329	1530	0	5.211	5.647
598	329	1730	0	227.556	0.455	598	329	1730	901	0.	0.
599	329	1930	0	227.556	0.455	599	329	1930	144	0.	0.
600	329	2130	0	227.556	0.455	600	329	2130	0	5.936	3.344
601	329	2330	0	227.556	0.455	601	329	2330	0	5.673	3.236
602	330	130	0	227.556	0.455	602	330	130	0	5.432	3.553
603	330	330	0	227.556	0.455	603	330	330	0	5.936	2.746
604	330	530	0	227.556	0.455	604	330	530	0	5.673	2.864
605	330	730	0	227.556	0.455	605	330	730	0	5.936	3.307
606	330	930	0	227.556	0.455	606	330	930	0	5.936	2.872
607	330	1130	0	227.556	0.455	607	330	1130	1	5.673	2.245
608	330	1330	0	227.556	0.455	608	330	1330	2	5.673	1.499
609	330	1530	0	227.556	0.455	609	330	1530	0	3.911	1.216
610	330	1730	0	227.556	0.455	610	330	1730	0	4.055	0.896
611	330	1930	0	227.556	0.455	611	330	1930	0	227.556	0.807
612	330	2130	0	227.556	0.455	612	330	2130	0	227.556	0.746
613	330	2330	0	227.556	0.455	613	330	2330	0	227.556	0.810
614	331	130	0	227.556	0.455	614	331	130	0	227.556	0.287
615	331	330	0	227.556	0.455	615	331	330	917	0.	0.
616	331	530	0	227.556	0.455	616	331	530	128	0.	0.
617	331	730	0	227.556	0.455	617	331	730	0	227.556	0.326
618	331	930	0	227.556	0.455	618	331	930	0	227.556	0.515
619	331	1130	0	227.556	0.455	619	331	1130	0	227.556	0.250
620	331	1330	0	227.556	0.455	620	331	1330	0	227.556	0.944
621	331	1530	0	227.556	0.455	621	331	1530	0	227.556	1.134
622	331	1730	0	227.556	0.455	622	331	1730	0	227.556	0.334
623	331	1930	0	227.556	0.455	623	331	1930	0	227.556	0.129
624	331	2130	0	227.556	0.455	624	331	2130	0	227.556	0.524
625	331	2330	0	227.556	0.455	625	331	2330	0	227.556	0.261
626	332	130	0	227.556	0.455	626	332	130	0	227.556	0.515
627	332	330	0	227.556	0.455	627	332	330	0	227.556	1.078
628	332	530	0	227.556	0.455	628	332	530	0	227.556	0.953
629	332	730	0	227.556	0.455	629	332	730	0	227.556	1.023
630	332	930	0	227.556	0.455	630	332	930	0	227.556	2.548
631	332	1130	0	227.556	0.455	631	332	1130	0	227.556	0.891
632	332	1330	0	227.556	0.455	632	332	1330	933	0.	0.
633	332	1530	0	227.556	0.455	633	332	1530	96	0.	0.
634	332	1730	0	227.556	0.455	634	332	1730	0	227.556	0.619

(Continued)

Table 4 (Continued)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)
635	332	1930	0	5.007	0.306	635	332	1930	0	227.556	0.486
636	332	2130	0	227.556	0.353	636	332	2130	0	227.556	0.428
637	332	2330	0	227.556	0.342	637	332	2330	0	227.556	0.736
638	333	1330	0	5.007	0.432	638	333	1330	0	227.556	0.960
639	333	3330	0	5.007	0.429	639	333	3330	0	227.556	0.867
640	333	5330	0	4.844	0.340	640	333	5330	0	4.188	1.837
641	333	7330	0	227.556	0.448	641	333	7330	1	4.543	4.118
642	333	9330	0	5.211	0.642	642	333	9330	288	0.	0.
643	333	11330	0	5.007	0.795	643	333	11330	752	0.	0.
644	333	13330	0	5.007	0.543	644	333	13330	0	8.790	5.352
645	333	15330	0	5.211	0.646	645	333	15330	0	4.225	3.986
646	333	17330	0	5.211	0.773	646	333	17330	0	5.931	4.442
647	333	19330	0	5.211	1.166	647	333	19330	0	6.225	4.537
648	333	21330	0	5.007	0.928	648	333	21330	0	6.225	4.503
649	333	23330	0	4.819	0.865	649	333	23330	388	0.	0.
650	334	1330	0	5.007	0.835	650	334	1330	745	0.	0.
651	334	3330	0	5.936	1.027	651	334	3330	0	6.225	1.953
652	334	5330	0	6.225	1.137	652	334	5330	0	5.936	1.772
653	334	7330	0	5.936	1.227	653	334	7330	0	5.936	1.885
654	334	9330	0	5.211	1.188	654	334	9330	0	6.225	9.841
655	334	11330	0	5.007	1.165	655	334	11330	1	7.288	7.246
656	334	13330	0	4.819	1.093	656	334	13330	0	7.288	6.617
657	334	15330	0	5.007	1.077	657	334	15330	0	5.896	6.254
658	334	17330	0	5.936	1.002	658	334	17330	0	6.896	5.634
659	334	19330	0	5.007	1.023	659	334	19330	0	6.543	5.553
660	334	21330	0	5.211	0.835	660	334	21330	0	6.543	5.841
661	334	23330	0	5.936	0.891	661	334	23330	0	6.896	6.277
662	335	1330	0	5.936	0.912	662	335	1330	0	6.225	6.084
663	335	3330	0	5.007	0.734	663	335	3330	0	6.543	5.427
664	335	5330	0	5.432	0.870	664	335	5330	0	6.896	5.224
665	335	7330	0	5.007	0.756	665	335	7330	0	6.225	4.897
666	335	9330	0	5.007	0.733	666	335	9330	1	5.936	4.402
667	335	11330	0	4.819	0.718	667	335	11330	1	5.432	3.220
668	335	13330	0	5.007	0.705	668	335	13330	0	5.432	3.066
669	335	15330	0	4.819	0.637	669	335	15330	0	5.936	3.774
670	335	17330	0	4.330	0.559	670	335	17330	0	6.543	3.669
671	335	19330	0	4.644	0.609	671	335	19330	0	5.936	3.114
672	335	21330	0	4.681	0.771	672	335	21330	0	5.211	2.059
673	335	23330	0	5.007	0.489	673	335	23330	2	5.211	1.881
674	336	1330	0	5.007	0.415	674	336	1330	0	4.819	1.668
675	336	3330	0	5.007	0.425	675	336	3330	0	4.819	1.821
676	336	5330	0	4.055	0.455	676	336	5330	0	5.007	1.601
677	336	7330	0	5.007	0.574	677	336	7330	0	4.819	1.541
678	336	9330	0	4.188	0.445	678	336	9330	0	4.819	1.497
679	336	11330	1	4.188	0.717	679	336	11330	0	4.481	1.606
680	336	13330	1	4.055	0.513	680	336	13330	951	0.	0.
681	336	15330	0	4.055	0.400	681	336	15330	96	0.	0.
682	336	17330	0	4.055	0.363	682	336	17330	0	5.007	1.821
683	336	19330	0	4.188	0.391	683	336	19330	0	4.819	1.949
684	336	21330	0	4.055	0.347	684	336	21330	0	5.211	2.330
685	336	23330	0	4.330	0.327	685	336	23330	0	5.211	2.213
686	337	1330	0	4.330	0.415	686	337	1330	0	5.432	2.034
687	337	3330	0	4.188	0.269	687	337	3330	0	5.432	2.082
688	337	5330	0	4.188	0.205	688	337	5330	0	5.432	2.300
689	337	7330	0	227.556	0.145	689	337	7330	0	5.673	2.247
690	337	9330	0	227.556	0.077	690	337	9330	1011	0.	0.
691	337	11330	0	227.556	0.111	691	337	11330	32	0.	0.
692	337	13330	0	227.556	0.123	692	337	13330	0	3.931	1.362
693	337	15330	0	227.556	0.123	693	337	15330	0	4.188	1.375

(Continued)

Table 4 (Concluded)

RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)	RECORD NUMBER	JULIAN DATE	TIME	BAD POINTS	SIG. PER. (SEC.)	SIG. MT. (FT.)
694	337	1730	0	227.556	0.305	694	337	1730	0	227.556	0.305
695	337	1930	0	227.556	0.252	695	337	1930	0	227.556	0.252
696	337	2130	0	227.556	0.153	696	337	2130	0	227.556	0.153
697	337	2330	0	227.556	0.274	697	337	2330	0	227.556	0.274
698	338	1330	0	227.556	0.186	698	338	1330	0	227.556	0.186
699	338	1530	0	227.556	0.135	699	338	1530	0	227.556	0.135
700	338	1730	0	227.556	0.233	700	338	1730	0	227.556	0.233
701	338	1930	0	227.556	0.249	701	338	1930	0	227.556	0.249
702	338	2130	0	227.556	0.138	702	338	2130	0	227.556	0.138
703	338	2330	0	227.556	0.202	703	338	2330	0	227.556	0.202
704	338	1330	0	227.556	0.135	704	338	1330	0	227.556	0.135
705	338	1530	0	227.556	0.204	705	338	1530	0	227.556	0.204
706	338	1730	0	227.556	0.188	706	338	1730	0	227.556	0.188
707	338	1930	0	227.556	0.134	707	338	1930	0	227.556	0.134
708	338	2130	0	227.556	0.160	708	338	2130	0	227.556	0.160
709	338	2330	0	227.556	0.118	709	338	2330	0	227.556	0.118
710	339	1330	0	227.556	0.181	710	339	1330	0	227.556	0.181
711	339	1530	0	227.556	0.161	711	339	1530	0	227.556	0.161
712	339	1730	0	227.556	0.168	712	339	1730	0	227.556	0.168
713	339	1930	0	227.556	0.143	713	339	1930	0	227.556	0.143
714	339	2130	0	227.556	0.285	714	339	2130	0	227.556	0.285
715	339	2330	0	227.556	0.140	715	339	2330	0	227.556	0.140
716	339	1330	0	227.556	0.176	716	339	1330	0	227.556	0.176
717	339	1530	0	227.556	0.370	717	339	1530	0	227.556	0.370
718	339	1730	0	227.556	0.234	718	339	1730	0	227.556	0.234
719	339	1930	0	227.556	0.116	719	339	1930	0	227.556	0.116
720	339	2130	0	227.556	0.097	720	339	2130	0	227.556	0.097
721	339	2330	0	227.556	0.274	721	339	2330	0	227.556	0.274
722	340	1330	0	227.556	0.318	722	340	1330	0	227.556	0.318
723	340	1530	0	227.556	0.208	723	340	1530	0	227.556	0.208
724	340	1730	0	227.556	0.207	724	340	1730	0	227.556	0.207
725	340	1930	0	227.556	0.254	725	340	1930	0	227.556	0.254
726	340	2130	0	227.556	0.166	726	340	2130	0	227.556	0.166
727	340	2330	0	227.556	0.	727	340	2330	0	227.556	0.
728	340	1330	640	227.556	0.	728	340	1330	640	227.556	0.
729	340	1530	0	227.556	0.097	729	340	1530	0	227.556	0.097
730	340	1730	0	227.556	0.274	730	340	1730	0	227.556	0.274
731	340	1930	0	227.556	0.318	731	340	1930	0	227.556	0.318
732	340	2130	0	227.556	0.208	732	340	2130	0	227.556	0.208
733	340	2330	0	227.556	0.207	733	340	2330	0	227.556	0.207
734	340	1330	0	227.556	0.254	734	340	1330	0	227.556	0.254
735	340	1530	0	227.556	0.166	735	340	1530	0	227.556	0.166
736	340	1730	0	227.556	0.	736	340	1730	0	227.556	0.
737	340	1930	0	227.556	0.097	737	340	1930	0	227.556	0.097
738	340	2130	0	227.556	0.274	738	340	2130	0	227.556	0.274
739	340	2330	0	227.556	0.318	739	340	2330	0	227.556	0.318
740	340	1330	0	227.556	0.208	740	340	1330	0	227.556	0.208
741	340	1530	0	227.556	0.207	741	340	1530	0	227.556	0.207
742	340	1730	0	227.556	0.254	742	340	1730	0	227.556	0.254
743	340	1930	0	227.556	0.166	743	340	1930	0	227.556	0.166
744	340	2130	0	227.556	0.	744	340	2130	0	227.556	0.
745	340	2330	0	227.556	0.097	745	340	2330	0	227.556	0.097
746	340	1330	0	227.556	0.274	746	340	1330	0	227.556	0.274
747	340	1530	0	227.556	0.318	747	340	1530	0	227.556	0.318
748	340	1730	0	227.556	0.208	748	340	1730	0	227.556	0.208
749	340	1930	0	227.556	0.207	749	340	1930	0	227.556	0.207
750	340	2130	0	227.556	0.254	750	340	2130	0	227.556	0.254
751	340	2330	0	227.556	0.166	751	340	2330	0	227.556	0.166
752	340	1330	0	227.556	0.	752	340	1330	0	227.556	0.
753	340	1530	0	227.556	0.097	753	340	1530	0	227.556	0.097
754	340	1730	0	227.556	0.274	754	340	1730	0	227.556	0.274
755	340	1930	0	227.556	0.318	755	340	1930	0	227.556	0.318
756	340	2130	0	227.556	0.208	756	340	2130	0	227.556	0.208
757	340	2330	0	227.556	0.207	757	340	2330	0	227.556	0.207
758	340	1330	0	227.556	0.254	758	340	1330	0	227.556	0.254
759	340	1530	0	227.556	0.166	759	340	1530	0	227.556	0.166
760	340	1730	0	227.556	0.	760	340	1730	0	227.556	0.
761	340	1930	0	227.556	0.097	761	340	1930	0	227.556	0.097
762	340	2130	0	227.556	0.274	762	340	2130	0	227.556	0.274
763	340	2330	0	227.556	0.318	763	340	2330	0	227.556	0.318
764	340	1330	0	227.556	0.208	764	340	1330	0	227.556	0.208
765	340	1530	0	227.556	0.207	765	340	1530	0	227.556	0.207
766	340	1730	0	227.556	0.254	766	340	1730	0	227.556	0.254
767	340	1930	0	227.556	0.166	767	340	1930	0	227.556	0.166
768	340	2130	0	227.556	0.	768	340	2130	0	227.556	0.
769	340	2330	0	227.556	0.097	769	340	2330	0	227.556	0.097
770	340	1330	0	227.556	0.274	770	340	1330	0	227.556	0.274
771	340	1530	0	227.556	0.318	771	340	1530	0	227.556	0.318
772	340	1730	0	227.556	0.208	772	340	1730	0	227.556	0.208
773	340	1930	0	227.556	0.207	773	340	1930	0	227.556	0.207
774	340	2130	0	227.556	0.254	774	340	2130	0	227.556	0.254
775	340	2330	0	227.556	0.166	775	340	2330	0	227.556	0.166
776	340	1330	0	227.556	0.	776	340	1330	0	227.556	0.
777	340	1530	0	227.556	0.097	777	340	1530	0	227.556	0.097
778	340	1730	0	227.556	0.274	778	340	1730	0	227.556	0.274
779	340	1930	0	227.556	0.318	779	340	1930	0	227.556	0.318
780	340	2130	0	227.556	0.208	780	340	2130	0	227.556	0.208
781	340	2330	0	227.556	0.207	781	340	2330	0	227.556	0.207
782	340	1330	0	227.556	0.254	782	340	1330	0	227.556	0.254
783	340	1530	0	227.556	0.166	783	340	1530	0	227.556	0.166
784	340	1730	0	227.556	0.	784	340	1730	0	227.556	0.
785	340	1930	0	227.556	0.097	785	340	1930	0	227.556	0.097
786	340	2130	0	227.556	0.274	786	340	2130	0	227.556	0.274
787	340	2330	0	227.556	0.318	787	340	2330	0	227.556	0.318
788	340	1330	0	227.556	0.208	788	340	1330	0	227.556	0.208
789	340	1530	0	227.556	0.207	789	340	1530	0	227.556	0.207
790	340	1730	0	227.556	0.254	790	340	1730	0	227.556	0.254
791	340	1930	0	227.556	0.166	791	340	1930	0	227.556	0.166
792	340	2130	0	227.556	0.	792	340	2130	0	227.556	0.
793	340	2330	0	227.556	0.097	793	340	2330	0	227.556	0.097
794	340	1330	0	227.556	0.274	794	340	1330	0	227.556	0.274
795	340	1530	0	227.556	0.318	795	340	1530	0	227.556	0.318
796	340	1730	0	227.556	0.208	796	340	1730	0	227.556	0.208
797	340	1930	0	227.556	0.207	797	340	1930	0	227.556	0.207
798	340	2130	0	227.556	0.254	798	340	2130	0	227.556	0.254
799	340	2330	0	227.556	0.166	799	340	2330	0	227.556	0.166
800	340	1330	0	227.556	0.	800	340	1330	0	227.556	0.

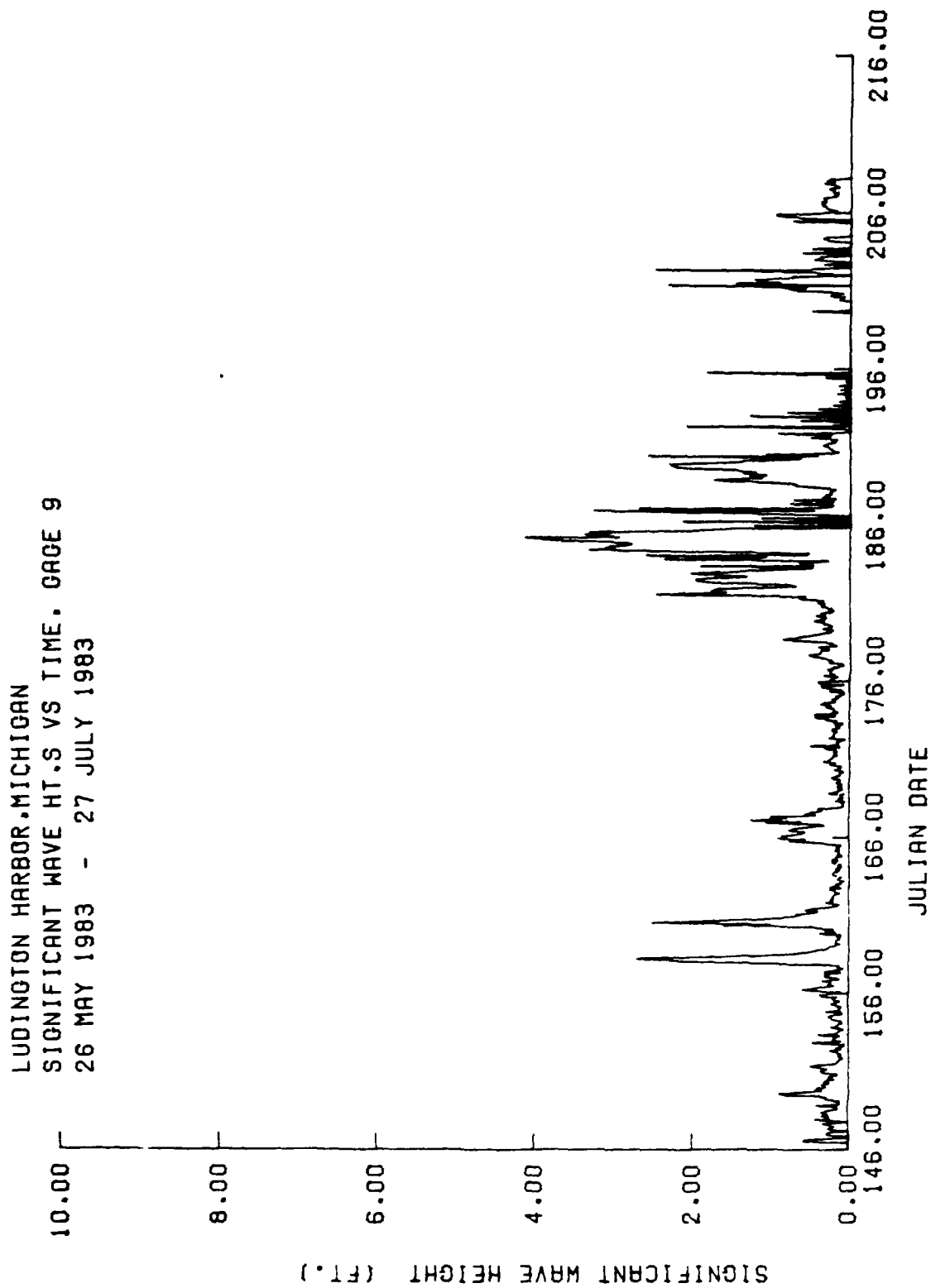
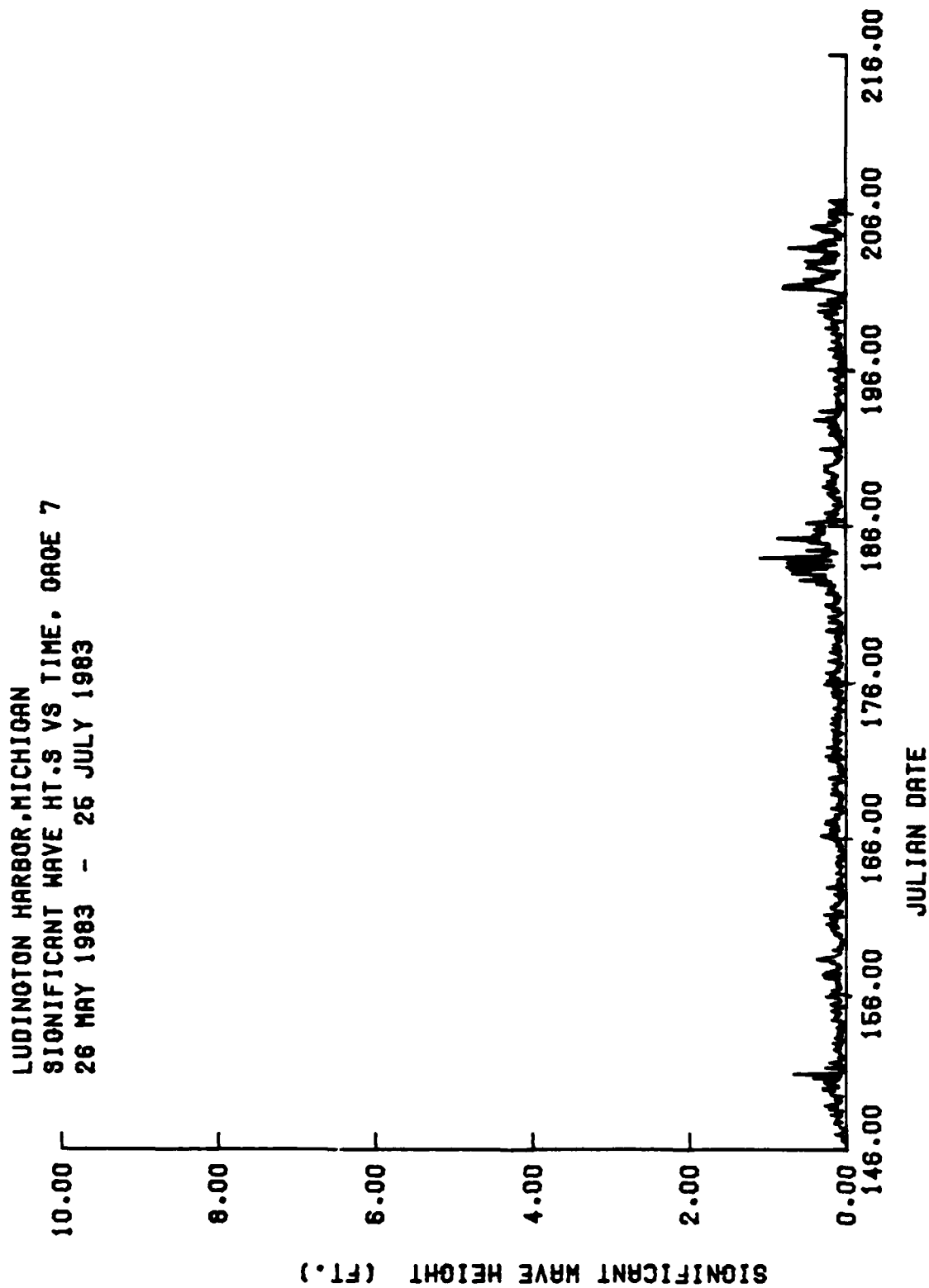
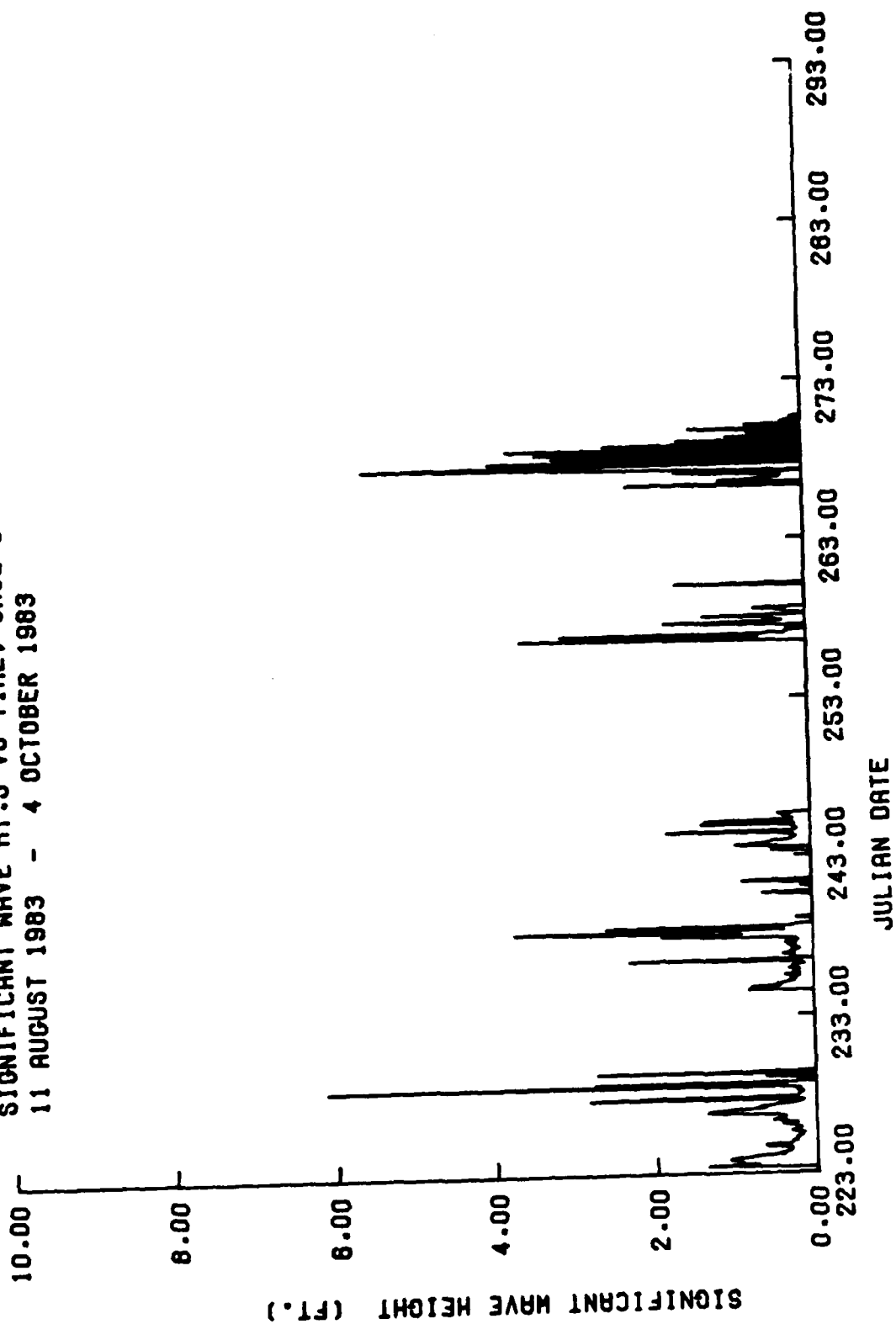


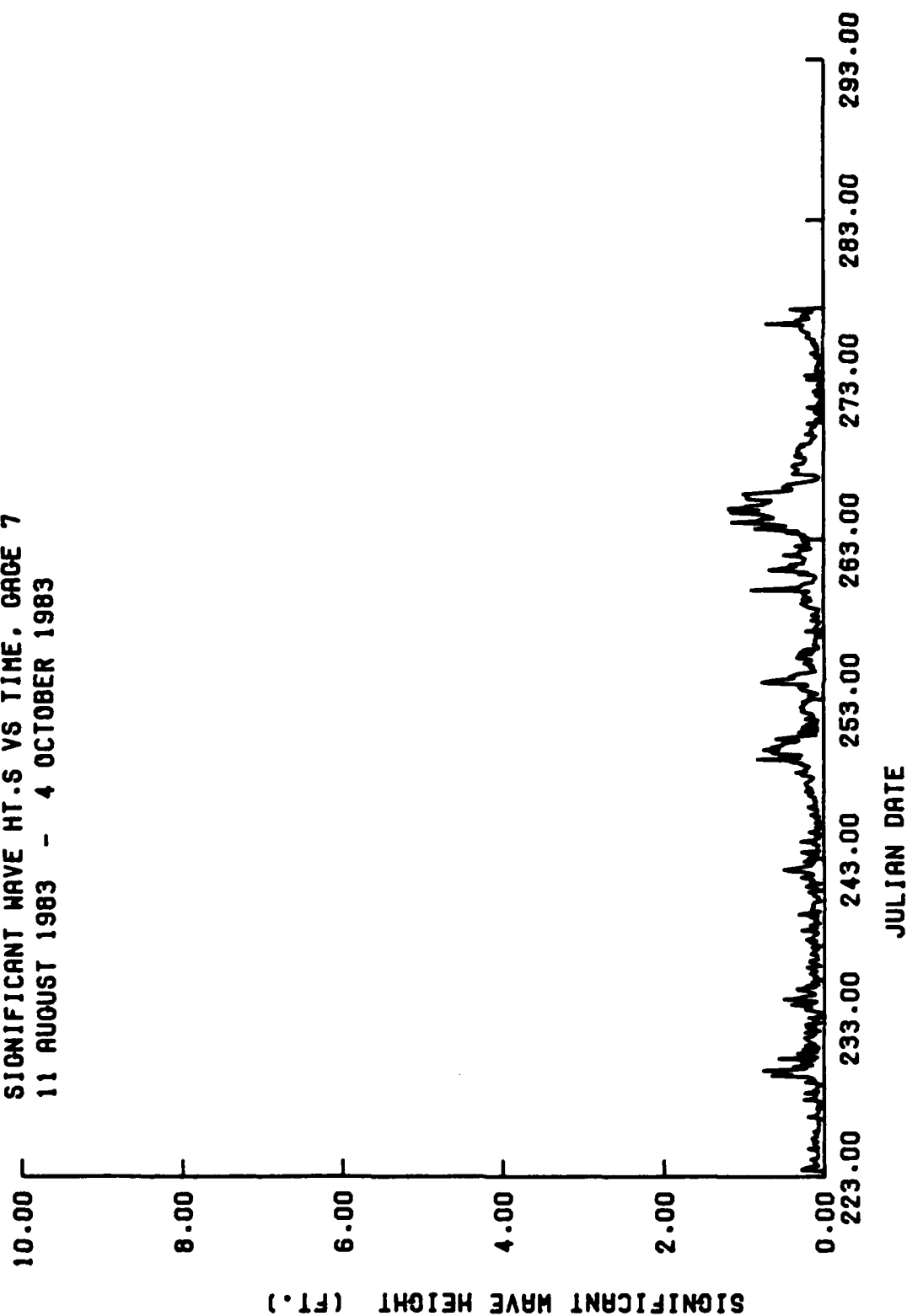
Plate 2



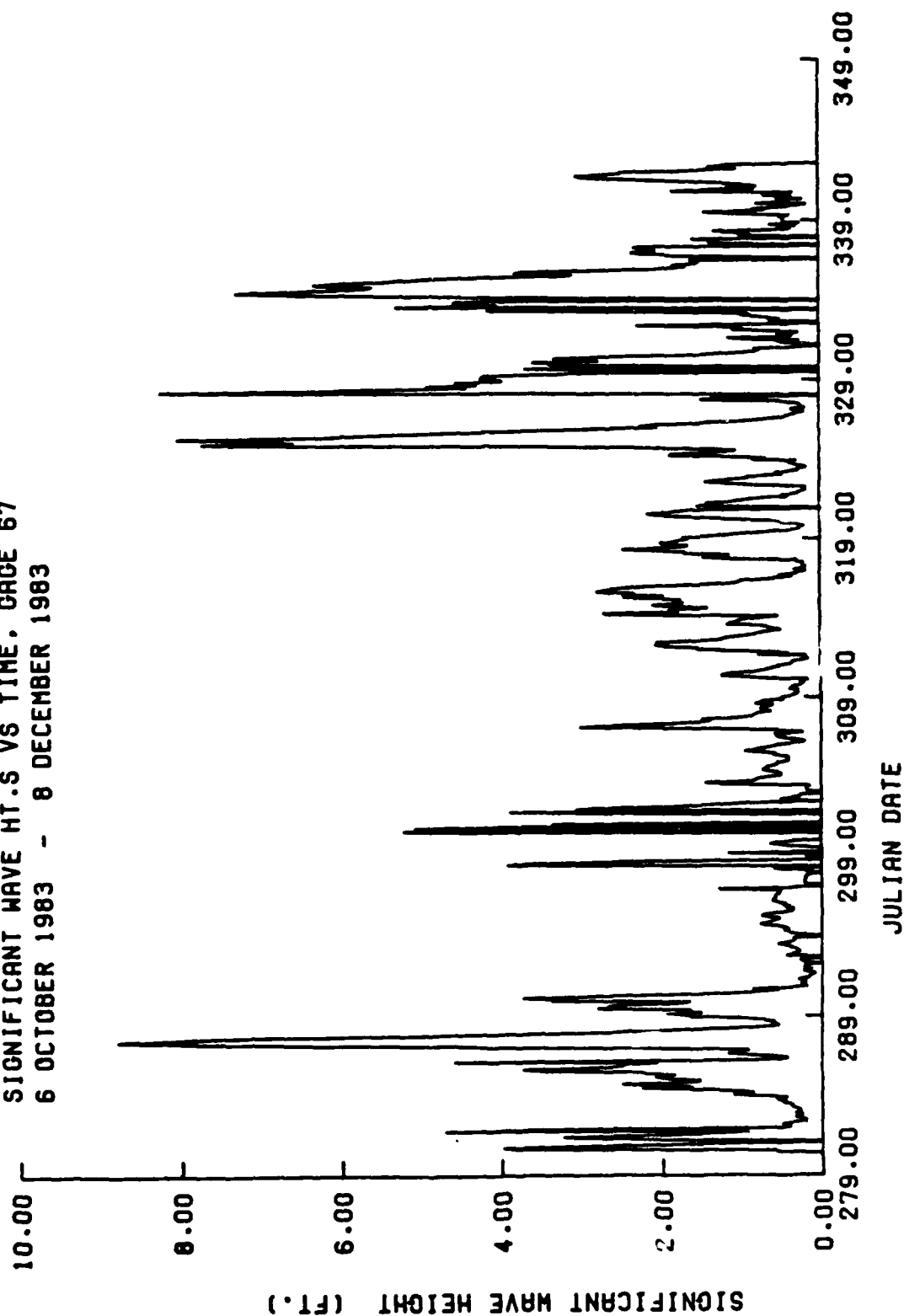
LUDINGTON HARBOR, MICHIGAN  
SIGNIFICANT WAVE HT. S VS TIME, GAGE 9  
11 AUGUST 1983 - 4 OCTOBER 1983



LUDINGTON HARBOR, MICHIGAN  
SIGNIFICANT WAVE HT. S VS TIME, GAGE 7  
11 AUGUST 1983 - 4 OCTOBER 1983

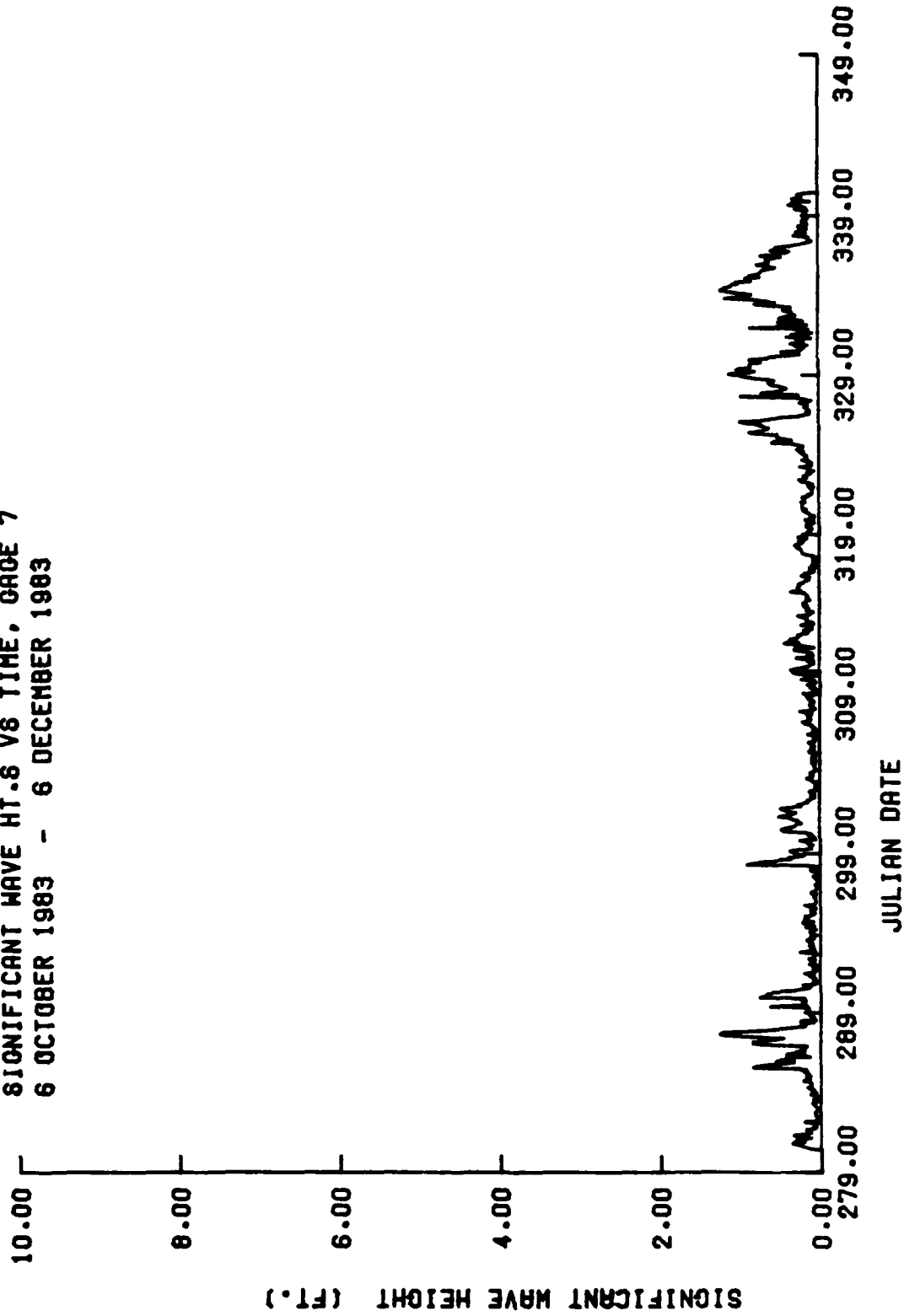


LUDINGTON HARBOR, MICHIGAN  
SIGNIFICANT WAVE HT. S VS TIME, GAGE 67  
6 OCTOBER 1983 - 8 DECEMBER 1983





LUDINGTON HARBOR, MICHIGAN  
SIGNIFICANT WAVE HT. 8 VS TIME, GRADE 7  
6 OCTOBER 1983 - 6 DECEMBER 1983



## APPENDIX A: WAVE DATA PROCESSING PROCEDURE

### Subsurface Pressure

1. Subsurface pressure under a wave is the summation of two contributing components, dynamic and static pressure, and is quantitatively defined as

$$p' = \rho g \frac{\cosh [2\pi(z + d)/L]}{\cosh (2\pi d/L)} \frac{H}{2} \cos \left[ \frac{2\pi x}{L} - \frac{2\pi t}{T} \right] - \rho g z + p_a \quad (A1)$$

where

$p'$  = total or absolute pressure

$\rho$  =  $w/g$  = mass density of water (for saltwater,  $\rho = 2.0 \text{ lb-sec}^2/\text{ft}^4 = 2.0 \text{ slugs}/\text{ft}^3$ ; for freshwater,  $\rho = 1.94 \text{ slugs}/\text{ft}^3$ )

$d$  = water depth

$H$  = wave height

$L$  = wave length

$T$  = wave period

$p_a$  = atmospheric pressure

The first term of Equation A1 represents a dynamic component due to acceleration, while the second term is the static component of pressure. For convenience, the pressure is usually taken as the gage pressure defined as

$$p = p' - p_a = \rho g \frac{\cosh [2\pi(z + d)/L]}{\cosh (2\pi d/L)} \frac{H}{2} \cos \left[ \frac{2\pi x}{L} - \frac{2\pi t}{T} \right] - \rho g z \quad (A2)$$

Equation A2 can be written as

$$p = \rho g \eta \frac{\cosh [2\pi(z + d)/L]}{\cosh (2\pi d/L)} - \rho g z \quad (A3)$$

2. It is often necessary to determine the height of surface waves based on subsurface measurements of pressure. For this purpose it is convenient to rewrite Equation A3 as

$$\eta = \frac{N(p + \rho g z)}{\rho g K_z} \quad (A4)$$

where

$N$  = correction factor equal to unity if the linear theory applies

$z$  = depth below the still-water level of the pressure gage

$K_z$  = pressure response factor

Several empirical studies have found  $N$  to be a function of period, depth, wave amplitude, and other factors. In general,  $N$  decreases with decreasing period, being greater than 1.0 for long-period waves and less than 1.0 for short-period waves.

3. The pressure response factor  $K_z$  is therefore written as

$$K_z = \frac{\cosh(kh)}{\cosh(kD)} \quad (A5)$$

where

$k$  = local wave number

$h$  = local water depth

$D$  = height of the sensor above the bottom

4. The spectral energy of the sea surface is thus related to the pressure spectrum by the following equation:

$$E_s(f) = \left[ \frac{\cosh(kh)}{\cosh(kD)} \right]^2 E_p(f) \quad (A6)$$

where subscripts  $s$  and  $p$  refer to the surface and pressure spectra, respectively.

5. The significant wave height  $H_s$  is quantitatively defined as

$$H_s = 4 \left[ \frac{1}{2\Delta t} \int_{1/T} E_s(f) df \right]^{1/2}$$

The processed data were smoothed by band averaging eight frequency components of the raw periodogram. The final bandwidth resolution  $B_e$  of the wave

spectra therefore is  $B_e = \frac{8}{1024} = 0.0078$  .

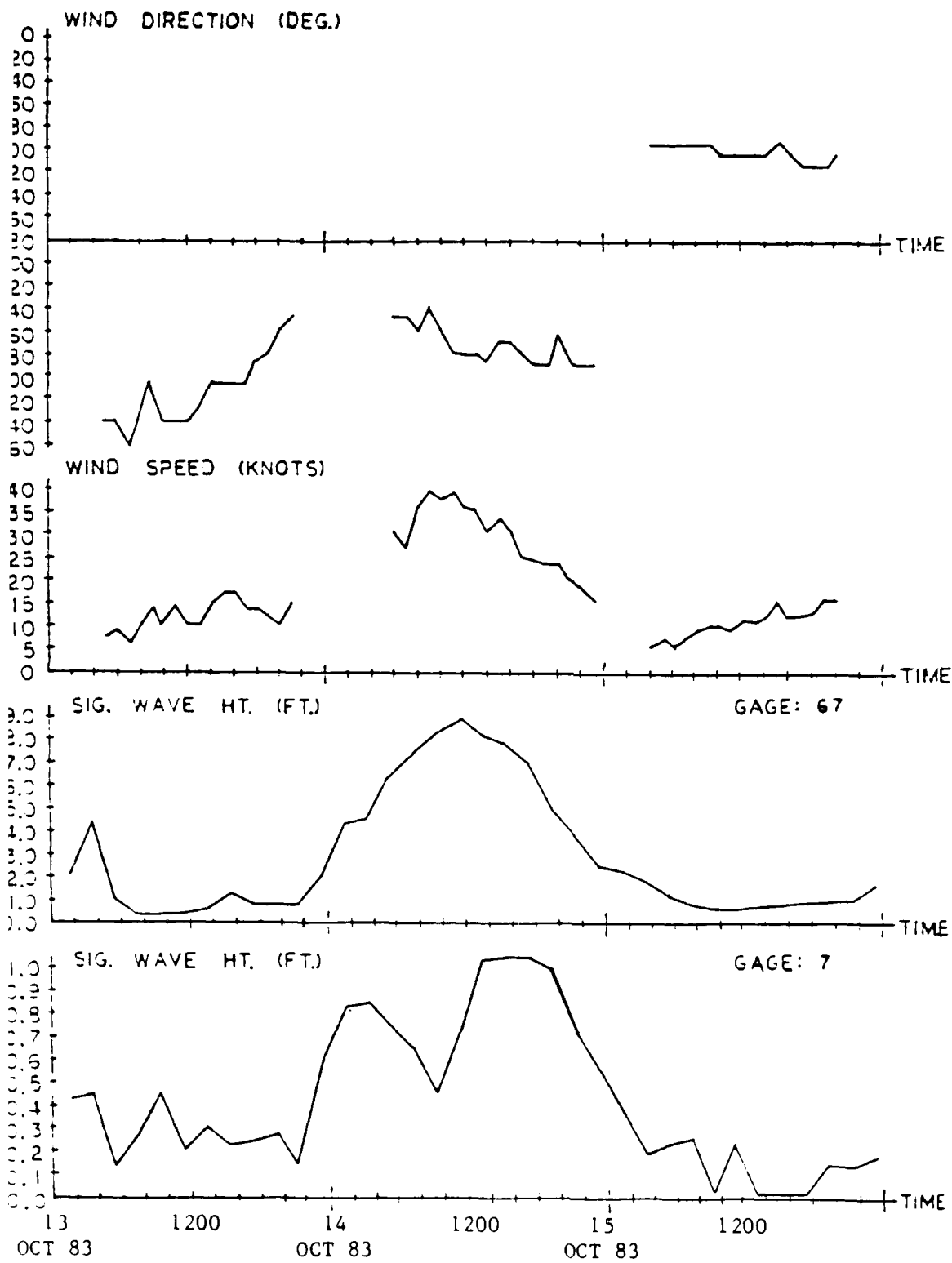
### Statistical Analysis

6. The wave record data were analyzed to obtain statistical parameters as functions of wave frequency. The statistical analysis output parameters were

- a. Band number - the  $n^{\text{th}}$  band of the wave frequency spectrum.
- b. Wave frequency - the central frequency of each band in the frequency spectrum.
- c. Wave period - the period corresponding to the wave frequency.
- d. Valid observations - the term "valid" means that the wave record contained 20 or fewer bad pressure samples.
- e. Percent of valid records - the quantity of valid observations compared to the total quantity of wave records.
- f. Probable maximum wave height - the probable height of the highest wave predicted by the Rayleigh Wave Height probability distribution, a height ratio of 1.87.

## APPENDIX B: WAVE DATA SUMMARY

1. This Appendix presents a summary of wave data. Pages B2, B25, B51, and B62 present wind speed, wind direction, and significant wave height data plots for (a) 13 October 1983 - 15 October 1983, (b) 20 November 1983 - 22 November 1983, (c) 24 November 1983 - 26 November 1983, and (d) 29 November 1983 - 1 December 1983, respectively. Corresponding spectral plots are presented for time periods (a), (b), (c), and (d) on the following pages: (a) pages B3-B24, (b) pages B26-B50, (c) pages B52-B61, and (d) pages B63-B82.



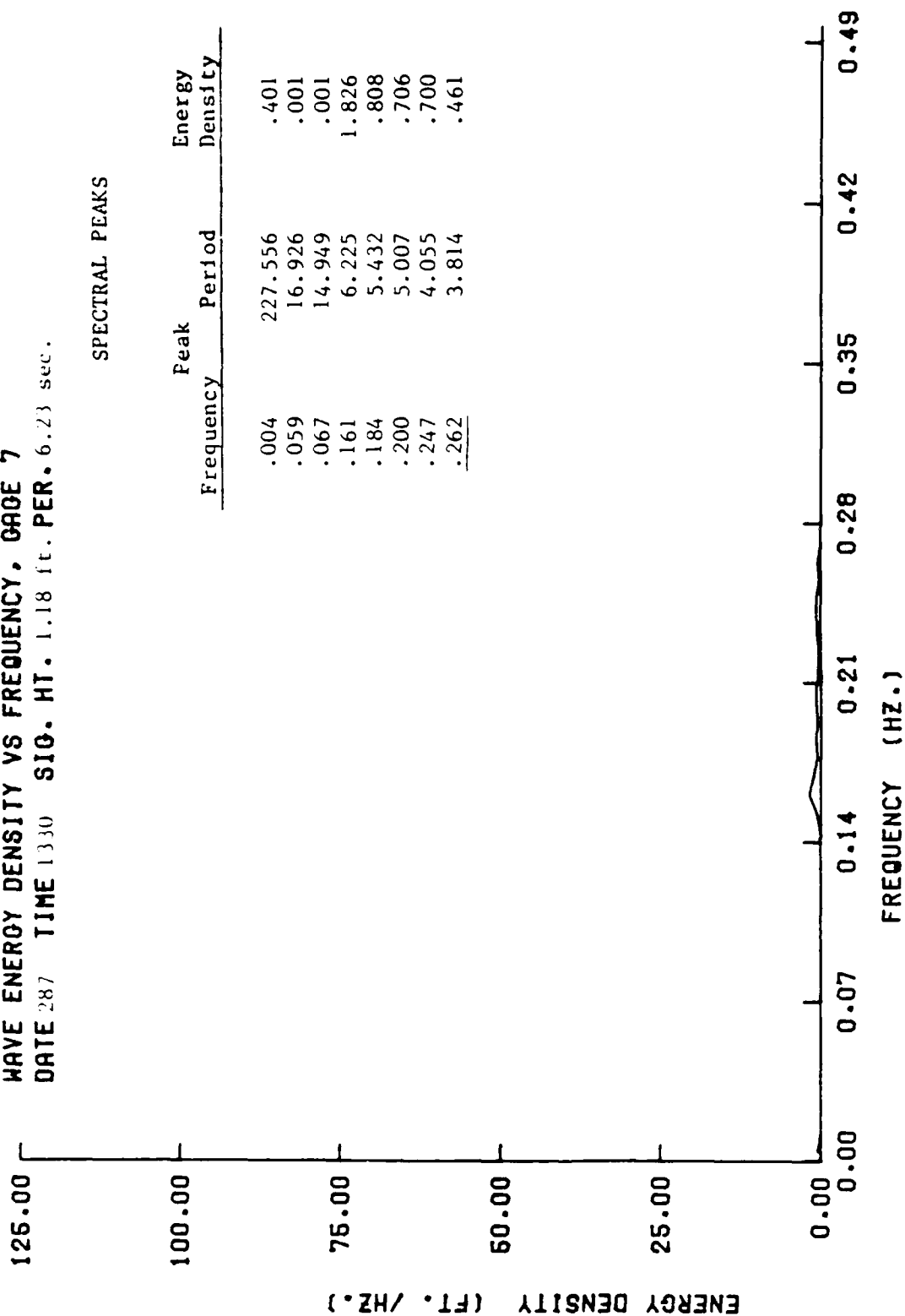
LOCATION UNKNOWN

# WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7

DATE 287 TIME 1330 SIG. HT. 1.18 ft. PER. 6.23 sec.

## SPECTRAL PEAKS

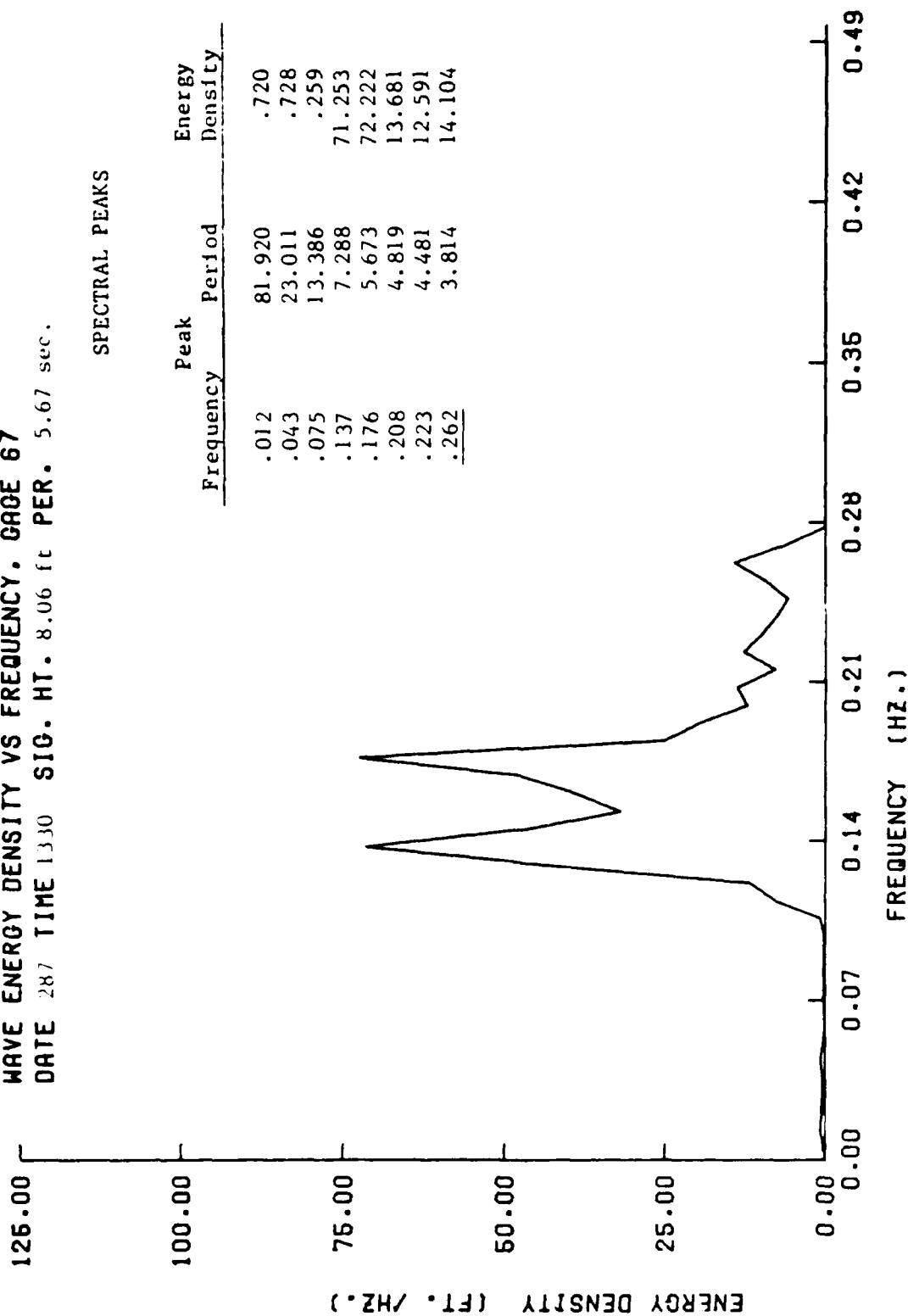
Peak		Energy Density
Frequency	Period	
.004	227.556	.401
.059	16.926	.001
.067	14.949	.001
.161	6.225	1.826
.184	5.432	.808
.200	5.007	.706
.247	4.055	.700
.262	3.814	.461



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
 DATE 287 TIME 1330 SIG. HT. 8.06 ft PER. 5.67 sec.

SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
.012	81.920	.720
.043	23.011	.728
.075	13.386	.259
.137	7.288	71.253
.176	5.673	72.222
.208	4.819	13.681
.223	4.481	12.591
<u>.262</u>	<u>3.814</u>	<u>14.104</u>

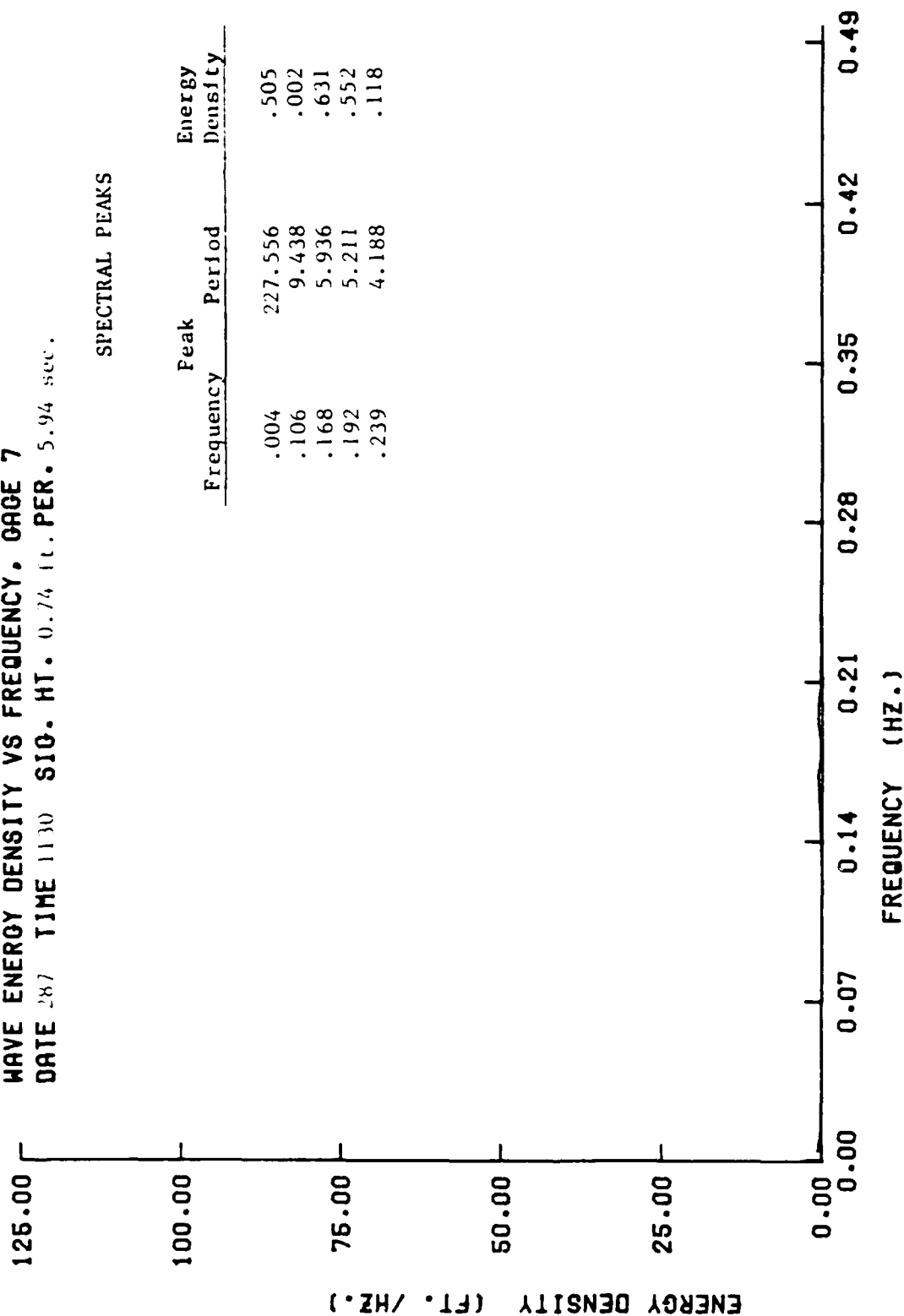




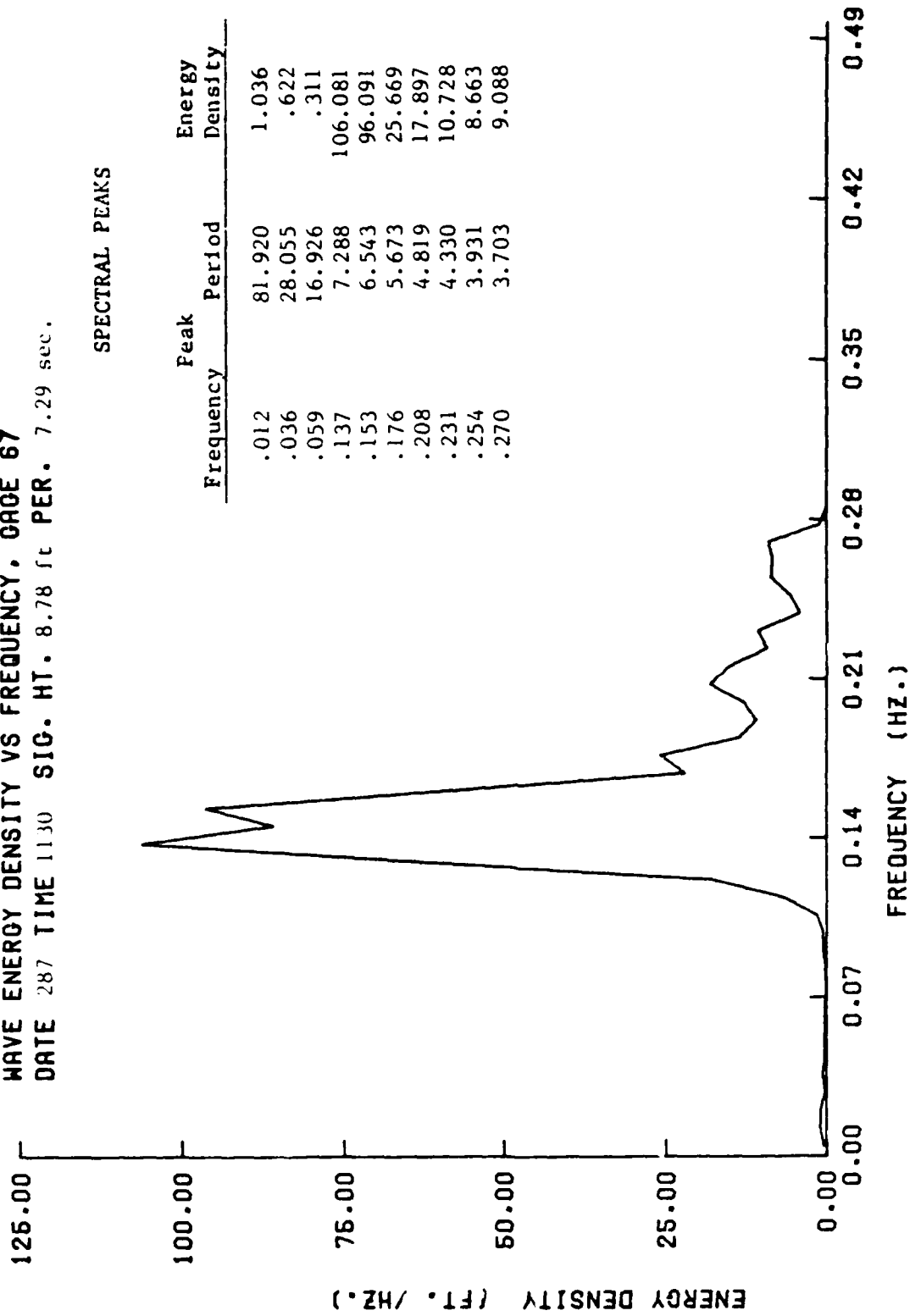
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7  
 DATE 287 TIME 1130 SIG. HT. 0.74 FT. PER. 5.94 sec.

SPECTRAL PEAKS

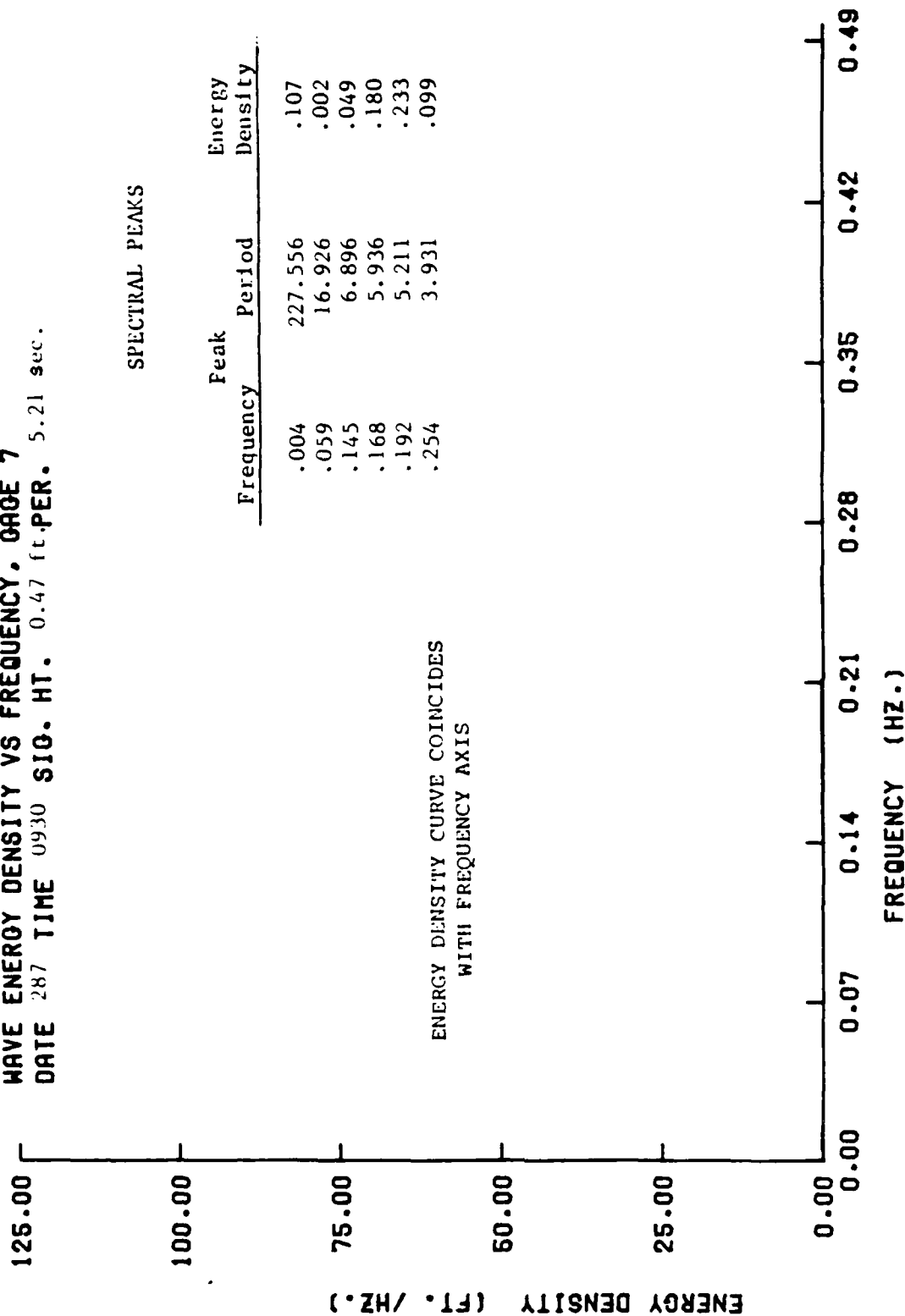
Peak		Energy Density
Frequency	Period	
.004	227.556	.505
.106	9.438	.002
.168	5.936	.631
.192	5.211	.552
.239	4.188	.118



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GRADE 67  
 DATE 287 TIME 1130 SIG. HT. 8.78 ft PER. 7.29 sec.



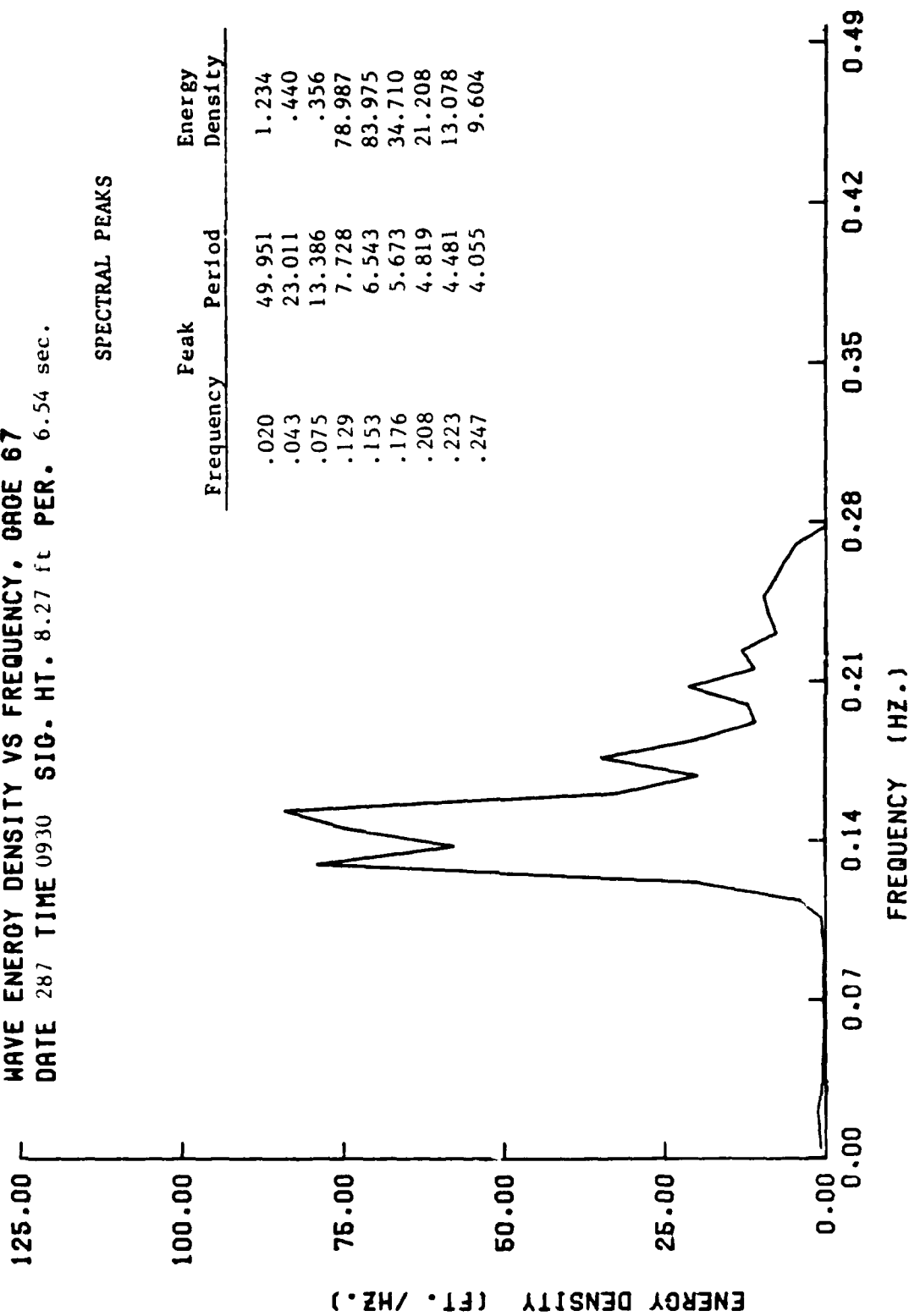
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 WAVE ENERGY DENSITY VS FREQUENCY, GRADE 7  
 DATE 287 TIME 0930 SIO. HT. 0.47 ft. PER. 5.21 sec.



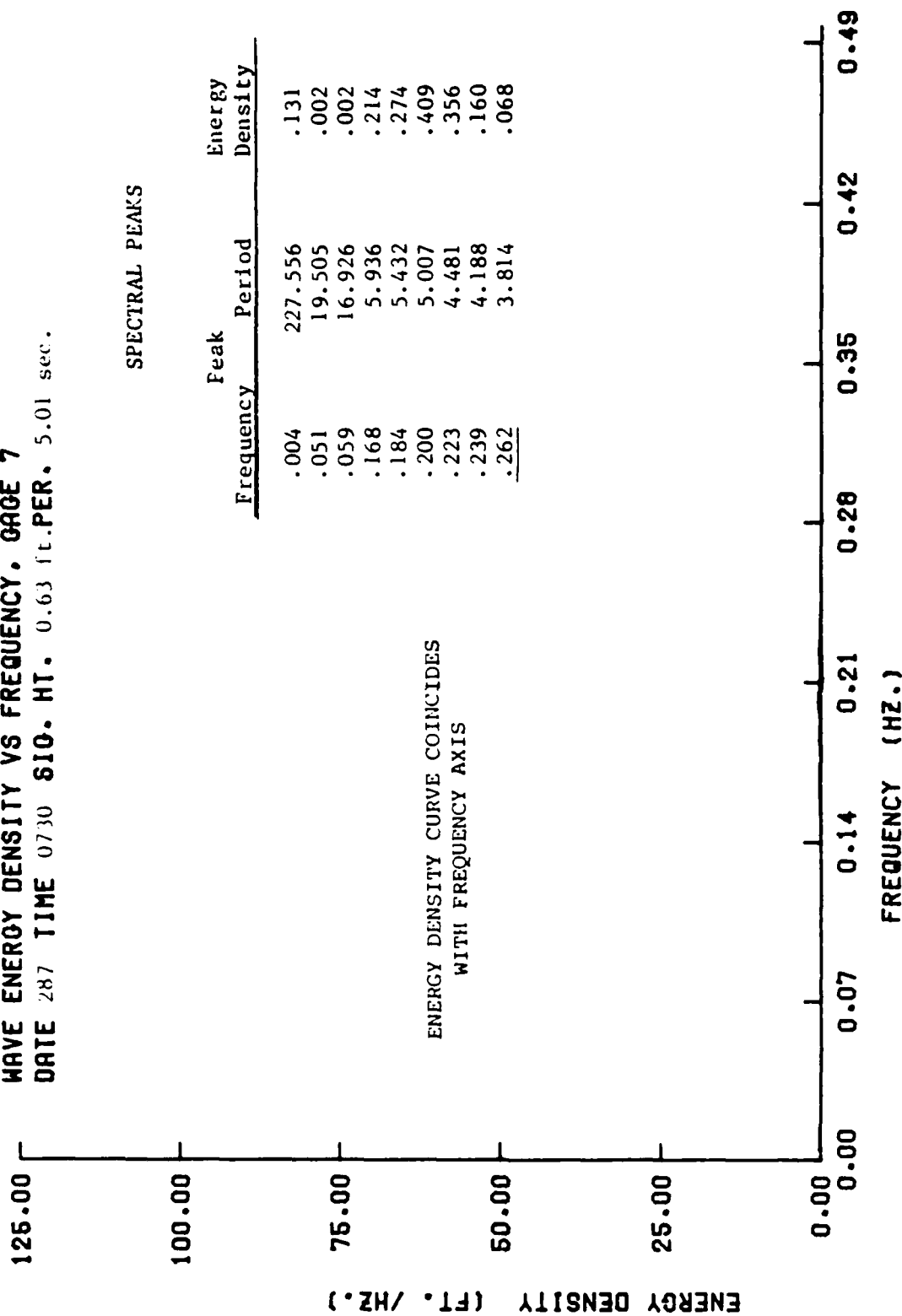
# LUDINGTON HARBOR, MICHIGAN

WAVE ENERGY DENSITY VS FREQUENCY, GRADE 67

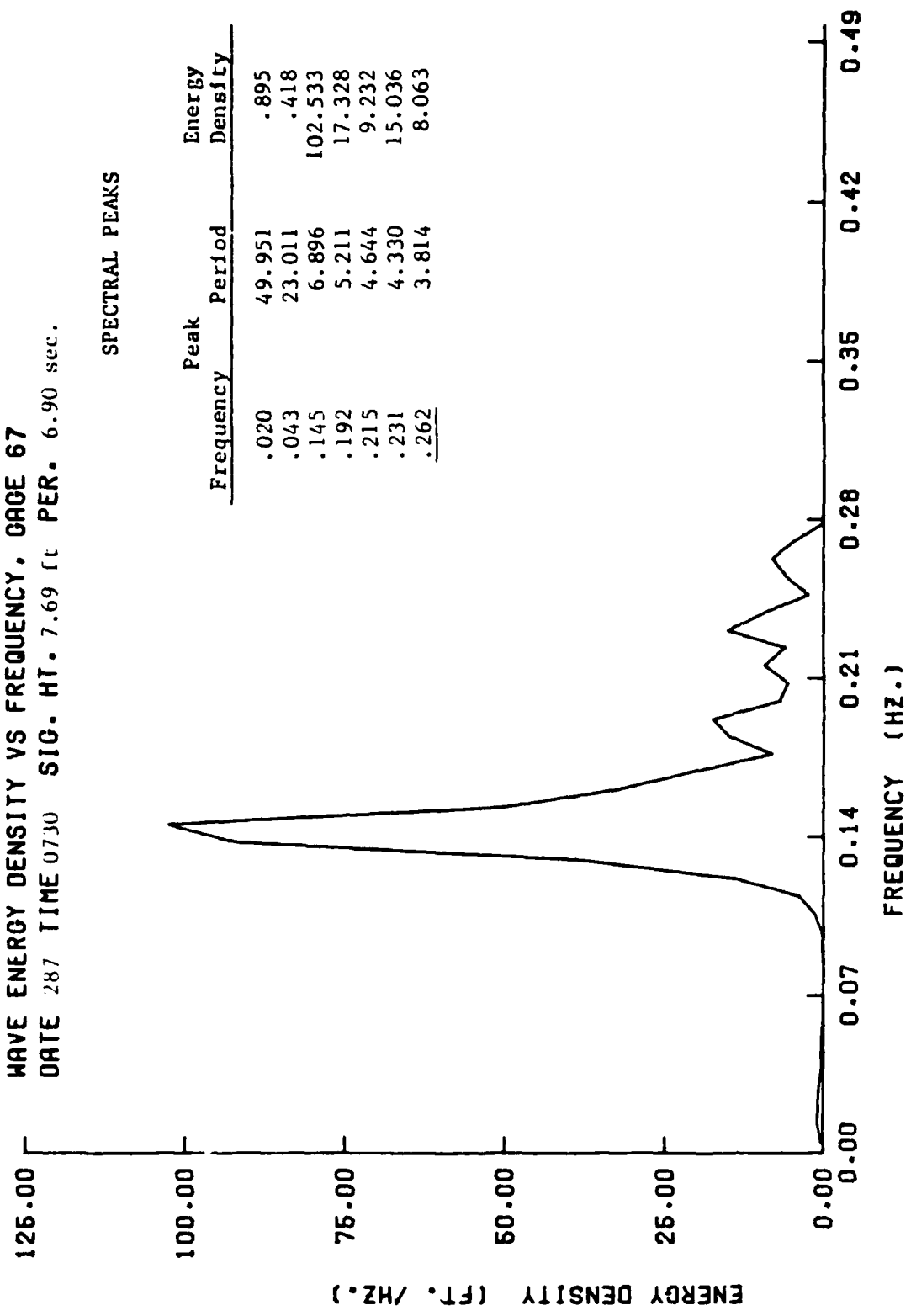
DATE 287 TIME 0930 SIG. HT. 8.27 ft PER. 6.54 sec.



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7  
 DATE 287 TIME 0730 SIO. HT. 0.63 ft. PER. 5.01 sec.



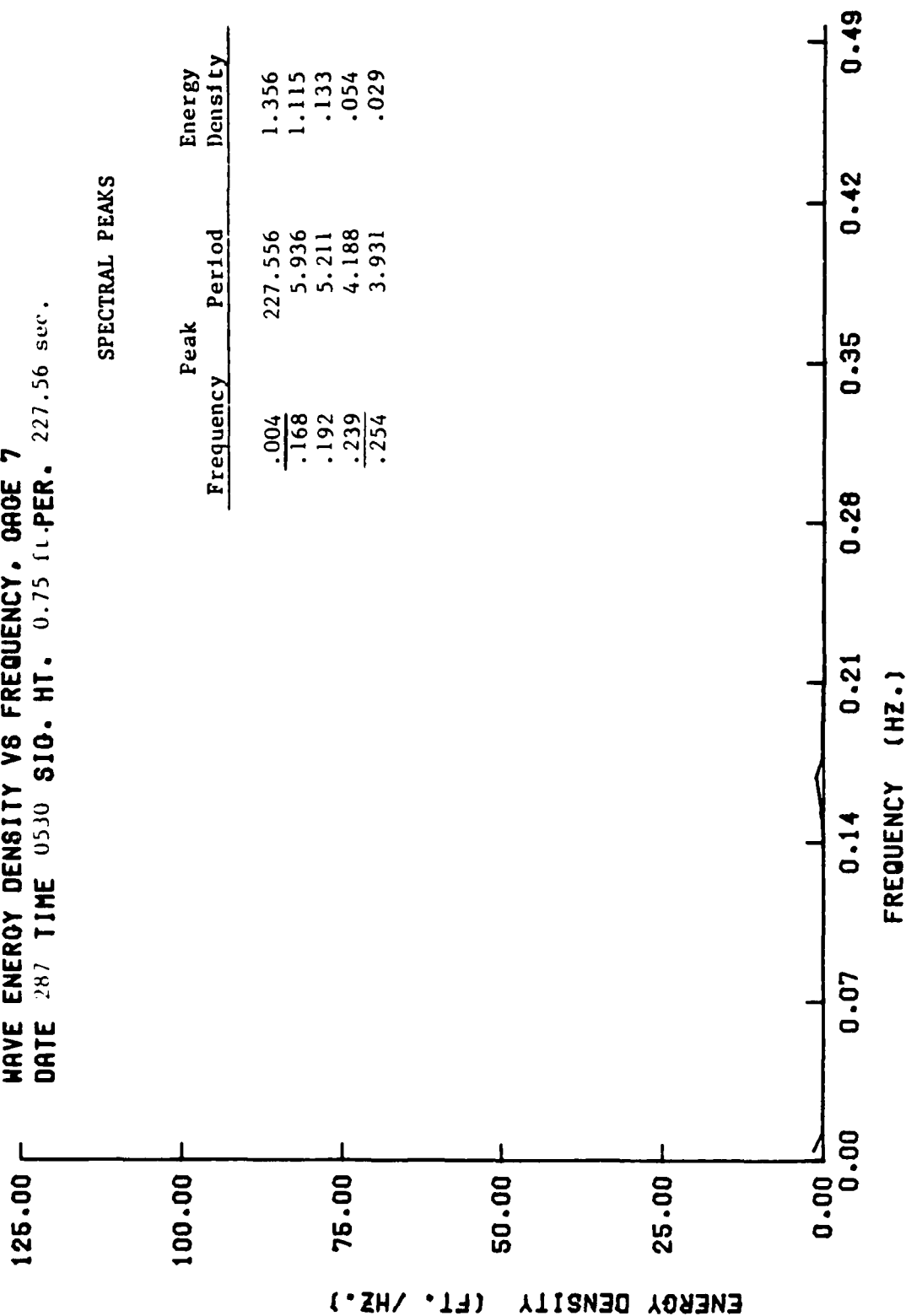
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
 DATE 287 TIME 0730 SIG. HT. 7.69 ft PER. 6.90 sec.



SPECTRAL PEAKS

Peak		Energy	
Frequency	Period	Density	
.020	49.951	.895	
.043	23.011	.418	
.145	6.896	102.533	
.192	5.211	17.328	
.215	4.644	9.232	
.231	4.330	15.036	
<u>.262</u>	<u>3.814</u>	<u>8.063</u>	

LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, PAGE 7  
 DATE 287 TIME 0530 SIG. HT. 0.75 ft. PER. 227.56 sec.



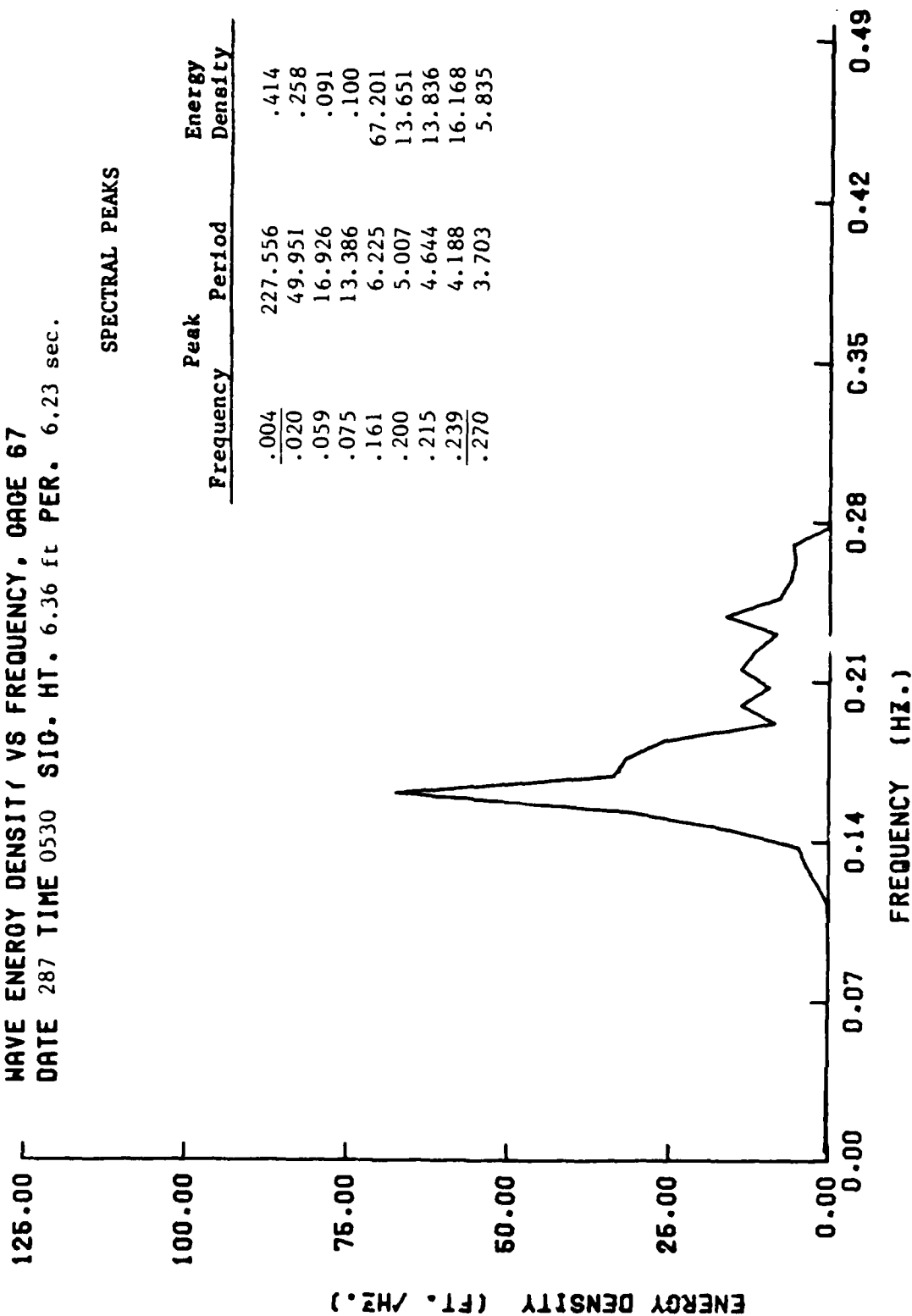
SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
.004	227.556	1.356
.168	5.936	1.115
.192	5.211	.133
.239	4.188	.054
.254	3.931	.029

LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
 DATE 287 TIME 0530 SIG. HT. 6.36 ft PER. 6.23 sec.

SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
.004	227.556	.414
.020	49.951	.258
.059	16.926	.091
.075	13.386	.100
.161	6.225	67.201
.200	5.007	13.651
.215	4.644	13.836
.239	4.188	16.168
.270	3.703	5.835

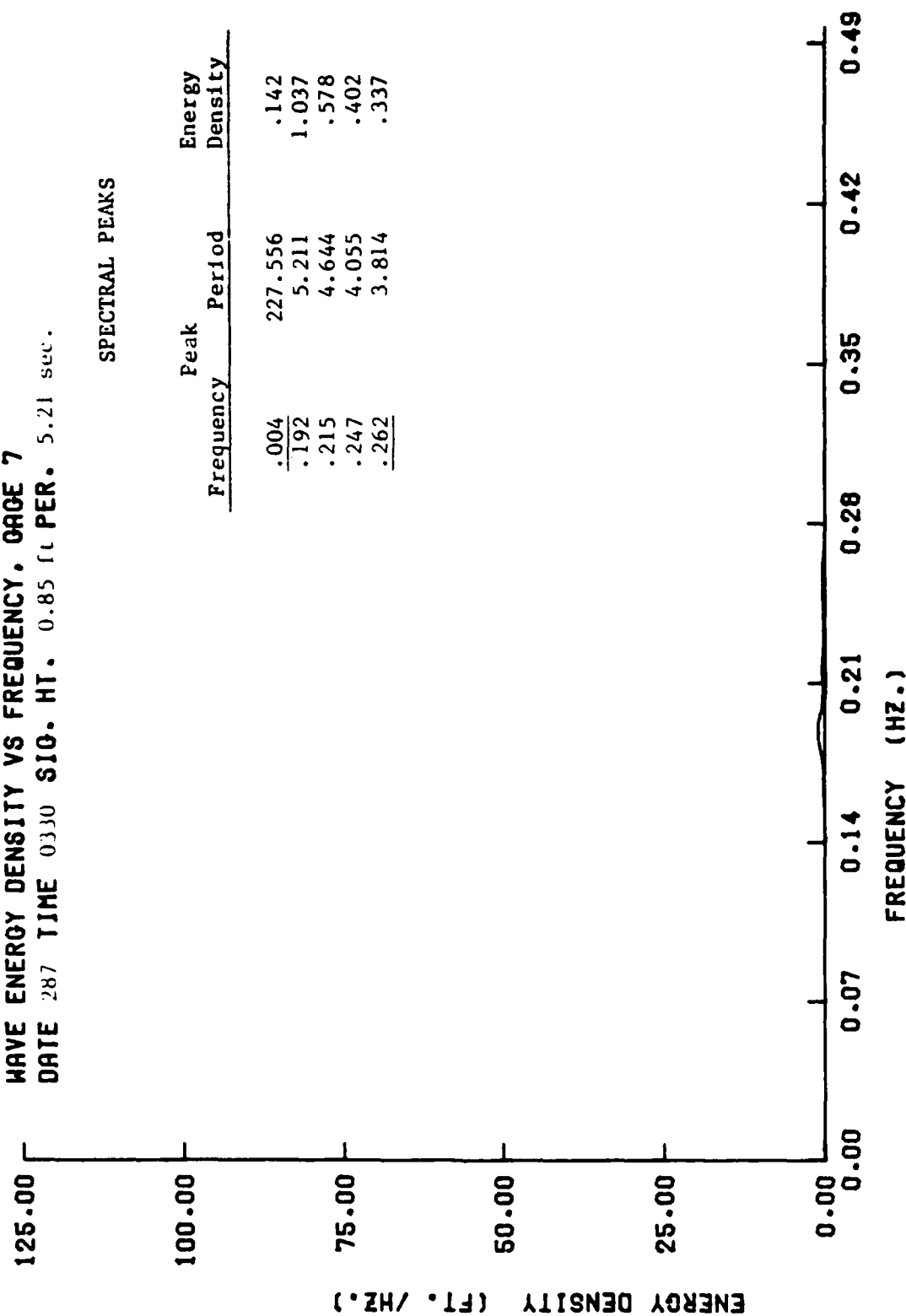




LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GRADE 7  
 DATE 287 TIME 0330 SIO. HT. 0.85 ft PER. 5.21 sec.

SPECTRAL PEAKS

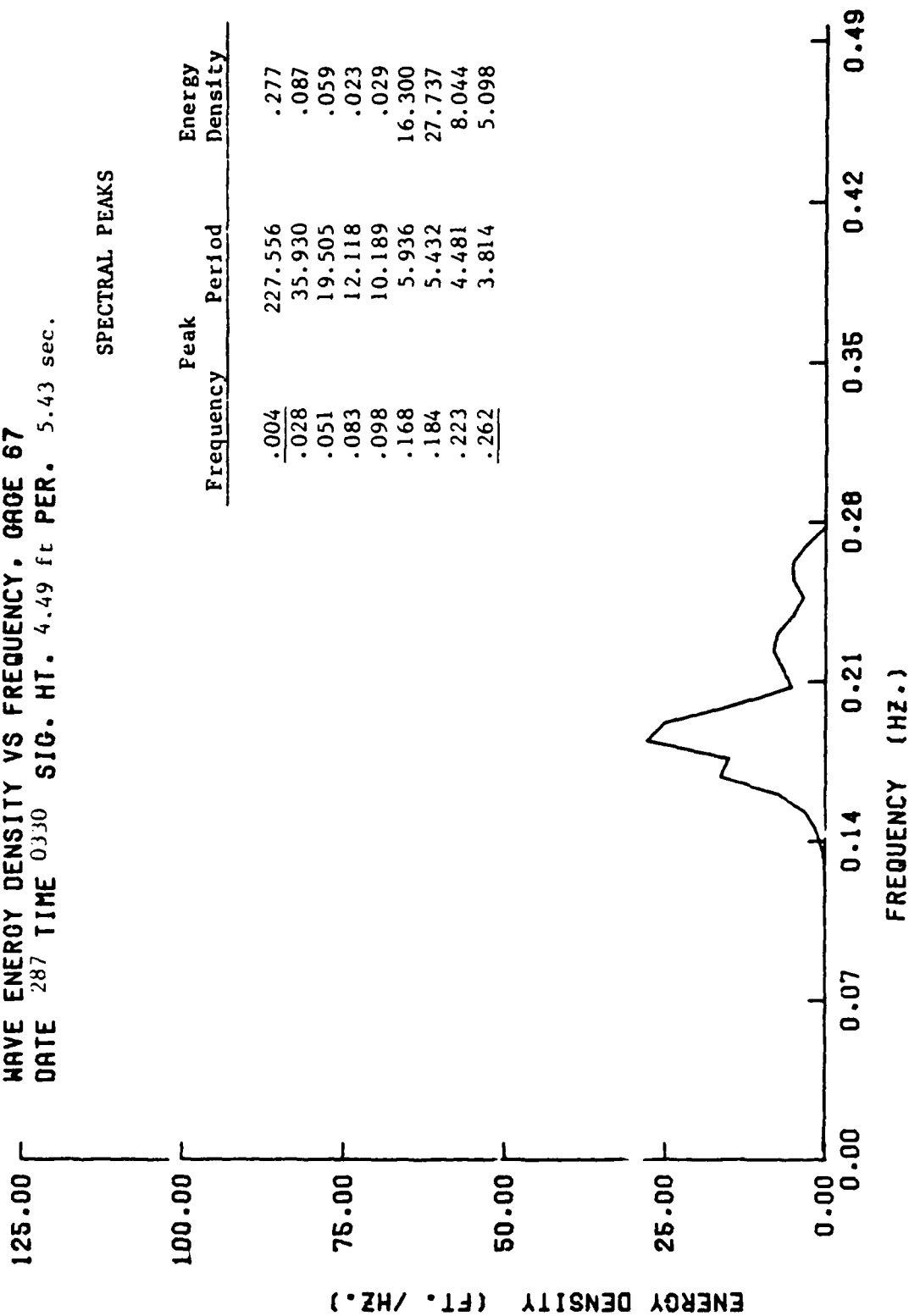
Peak		Energy Density
Frequency	Period	
.004	227.556	.142
<u>.192</u>	5.211	1.037
.215	4.644	.578
.247	4.055	.402
<u>.262</u>	3.814	.337



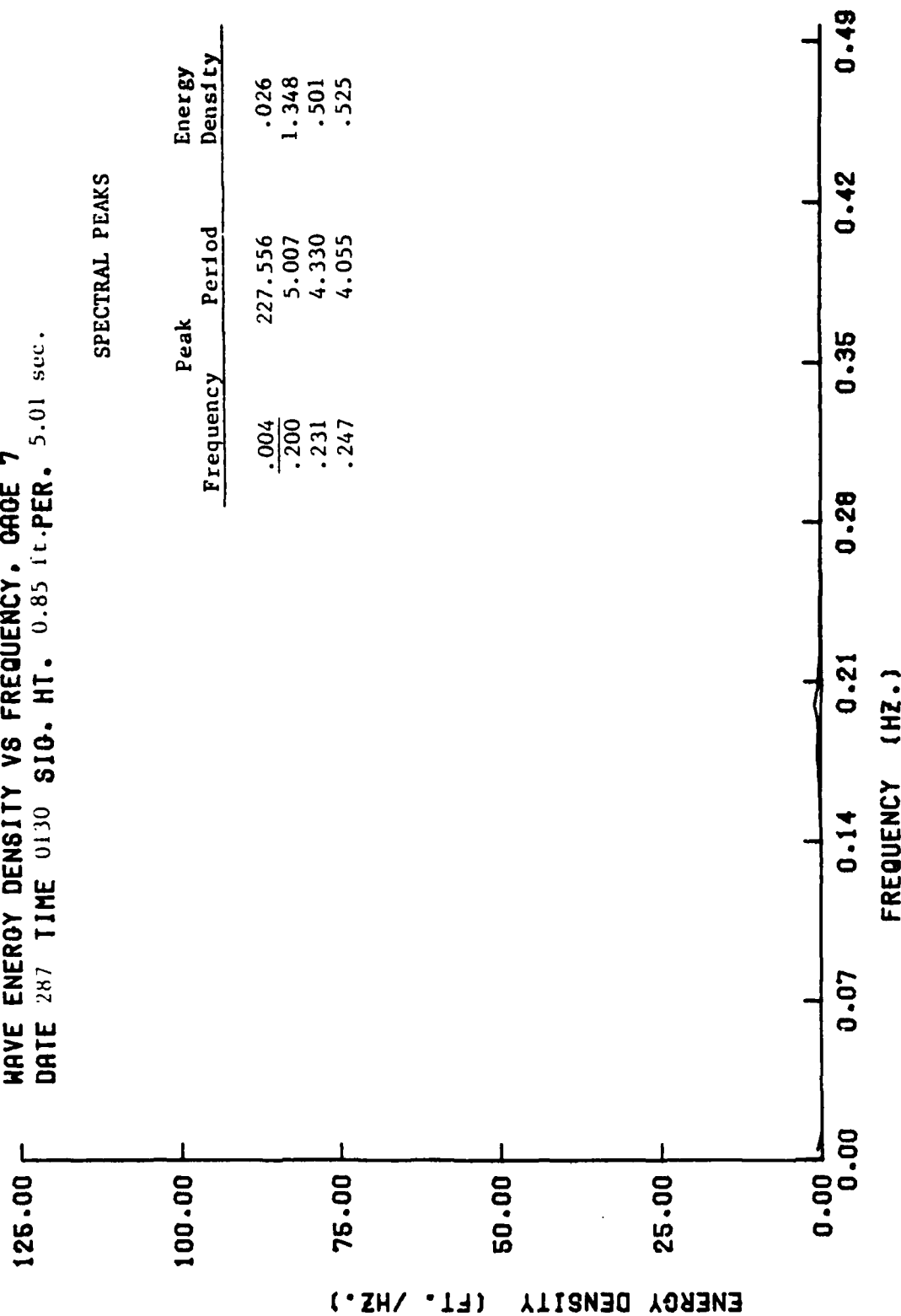
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GRADE 67  
 DATE 287 TIME 0330 SIG. HT. 4.49 ft PER. 5.43 sec.

SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
.004	227.556	.277
.028	35.930	.087
.051	19.505	.059
.083	12.118	.023
.098	10.189	.029
.168	5.936	16.300
.184	5.432	27.737
.223	4.481	8.044
.262	3.814	5.098



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GRADE 7  
 DATE 287 TIME 0130 SIG. HT. 0.85 ft. PER. 5.01 sec.



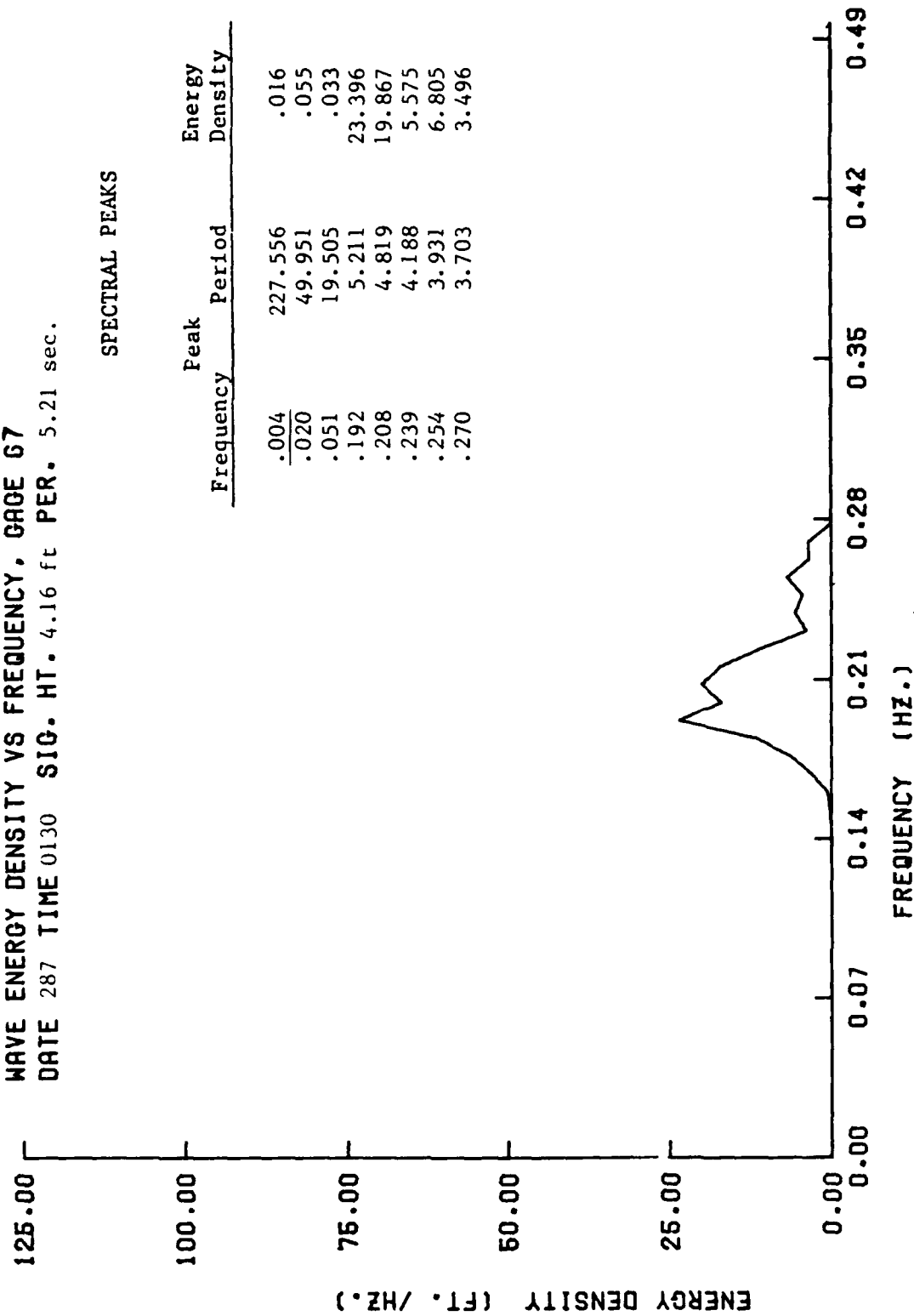
SPECTRAL PEAKS

Peak		Period	Energy Density
Frequency			
.004	227.556		.026
.200	5.007		1.348
.231	4.330		.501
.247	4.055		.525

LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE G7  
 DATE 287 TIME 0130 SIG. HT. 4.16 ft PER. 5.21 sec.

SPECTRAL PEAKS

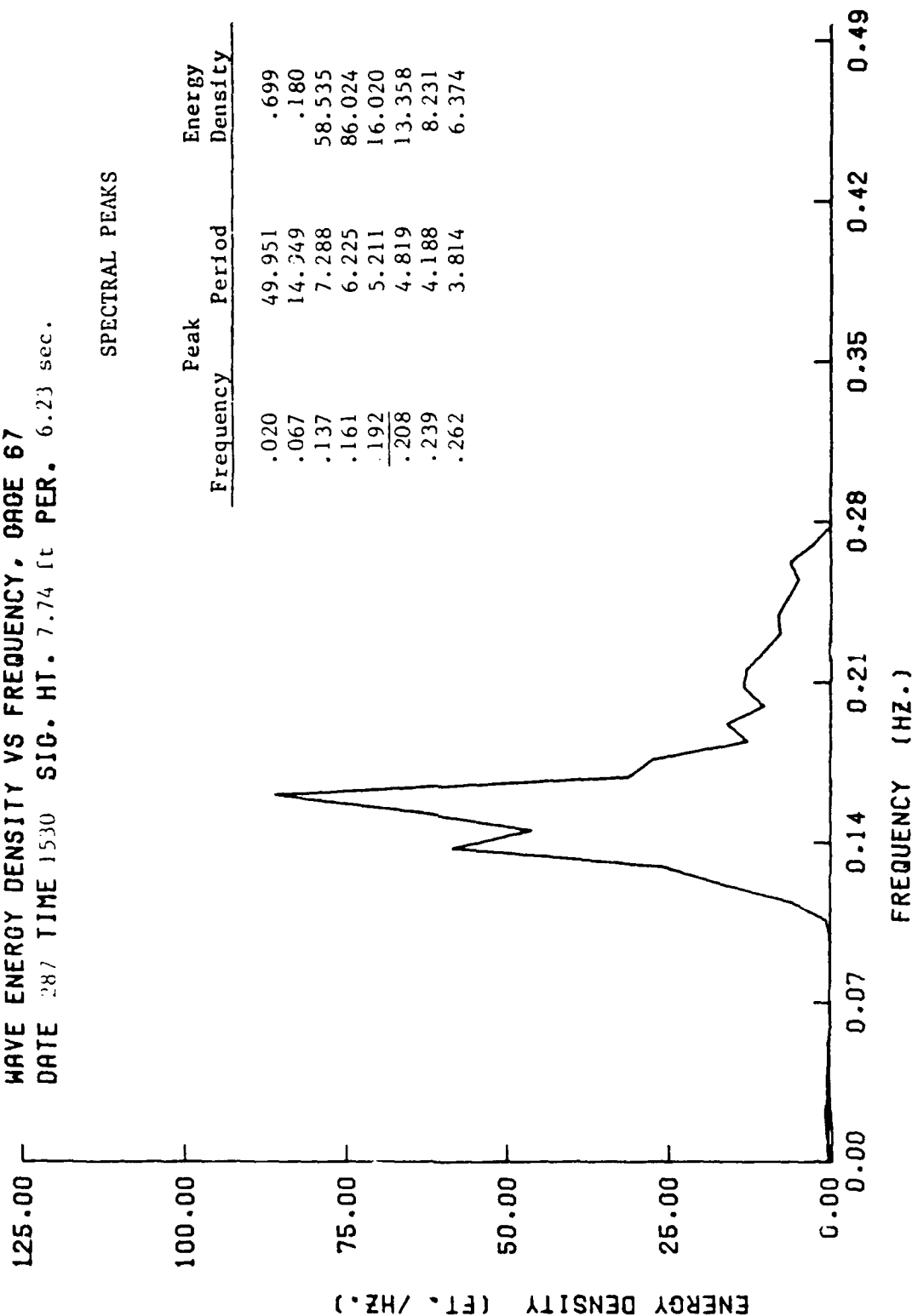
Peak Frequency	Period	Energy Density
.004	227.556	.016
.020	49.951	.055
.051	19.505	.033
.192	5.211	23.396
.208	4.819	19.867
.239	4.188	5.575
.254	3.931	6.805
.270	3.703	3.496



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GRADE 67  
 DATE 287 TIME 1530 SIG. HT. 7.74 ft PER. 6.23 sec.

SPECTRAL PEAKS

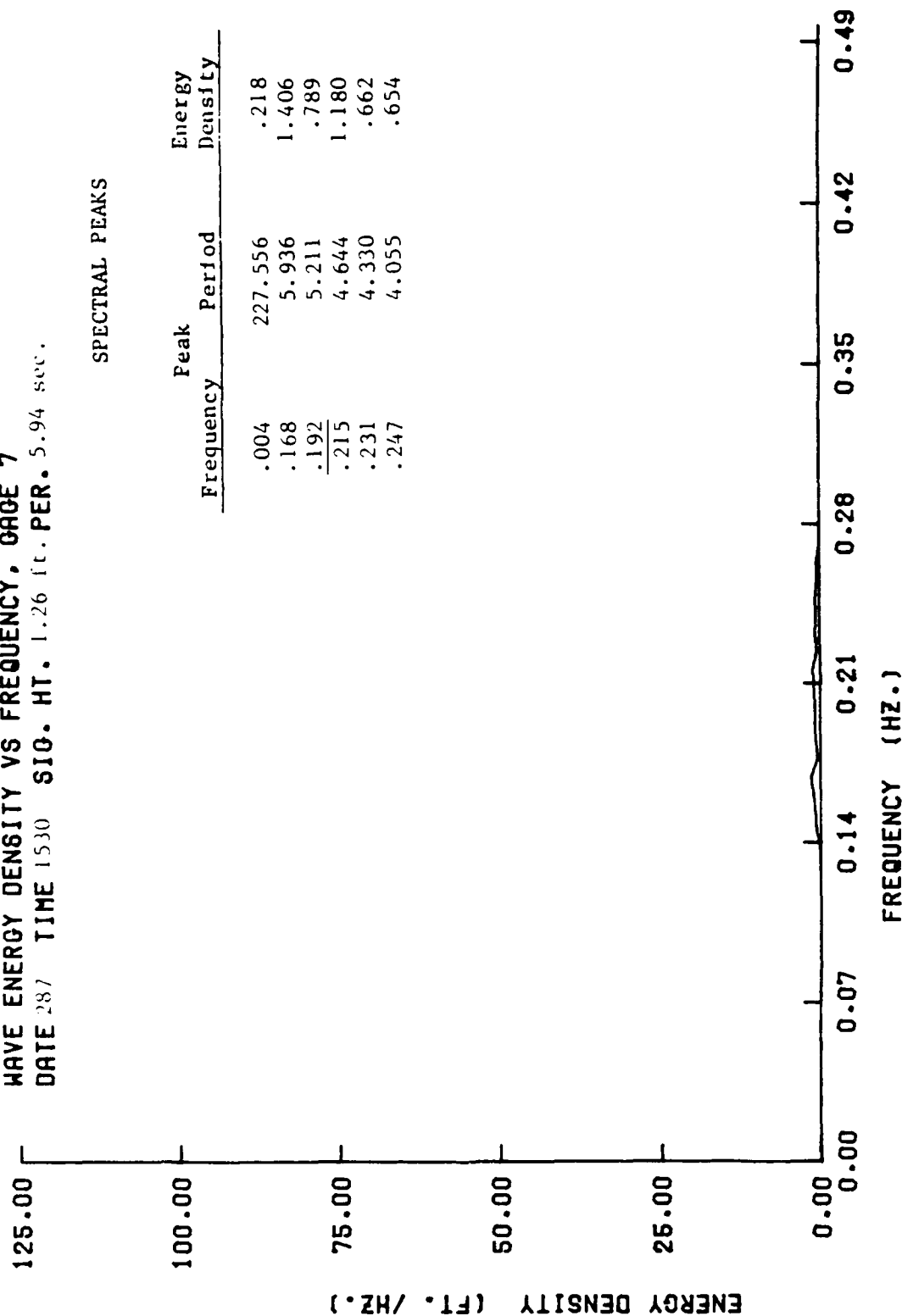
Peak		Period	Energy Density
Frequency			
.020		49.951	.699
.067		14.349	.180
.137		7.288	58.535
.161		6.225	86.024
.192		5.211	16.020
.208		4.819	13.358
.239		4.188	8.231
.262		3.814	6.374



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7  
 DATE 287 TIME 1530 SIO. HT. 1.26 ft. PER. 5.94 sec.

SPECTRAL PEAKS

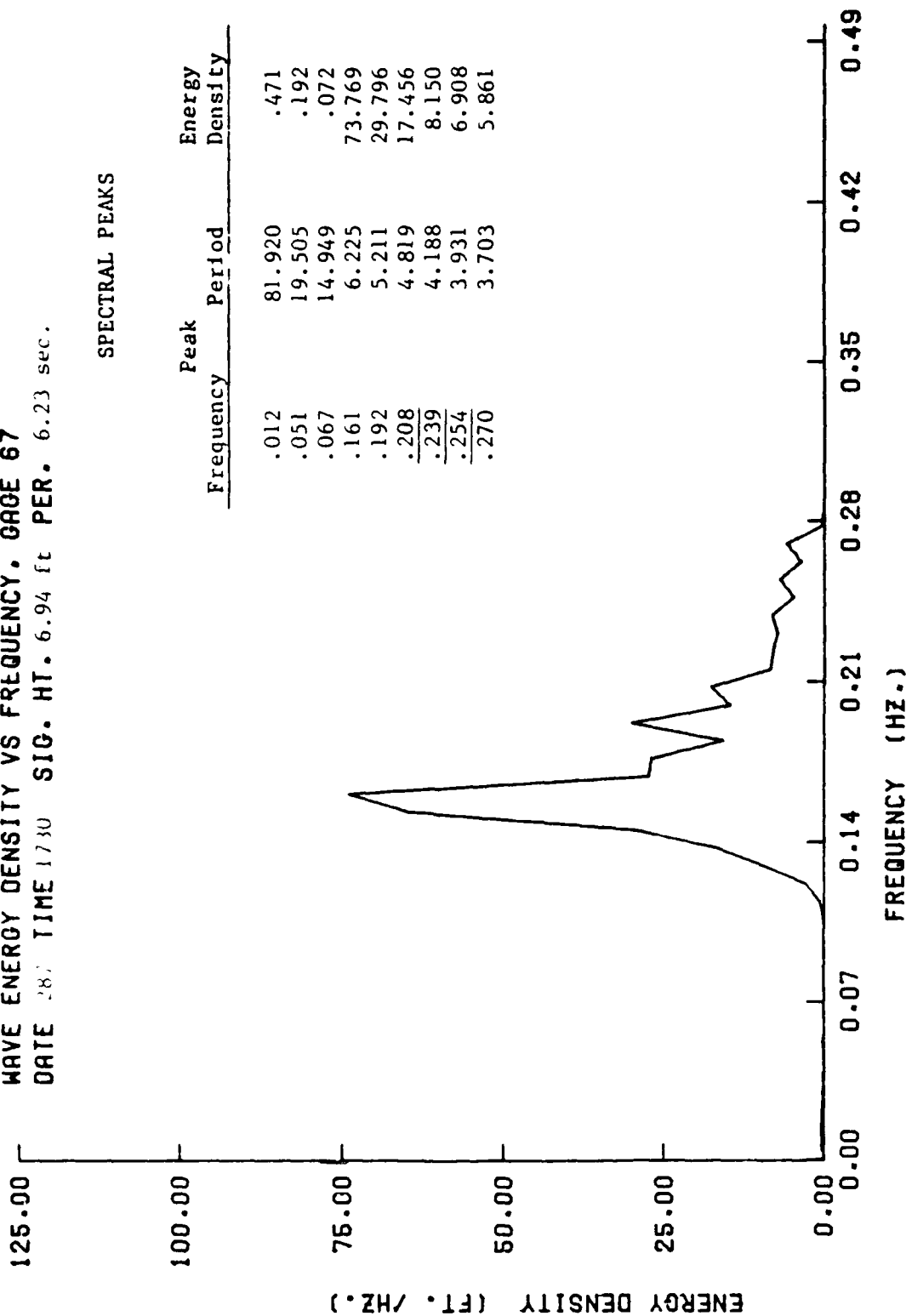
Peak		Period	Energy Density
Frequency			
.004		227.556	.218
.168		5.936	1.406
.192		5.211	.789
.215		4.644	1.180
.231		4.330	.662
.247		4.055	.654



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY. GAGE 67  
 DATE 287 TIME 1730 SIG. HT. 6.94 ft PER. 6.23 sec.

SPECTRAL PEAKS

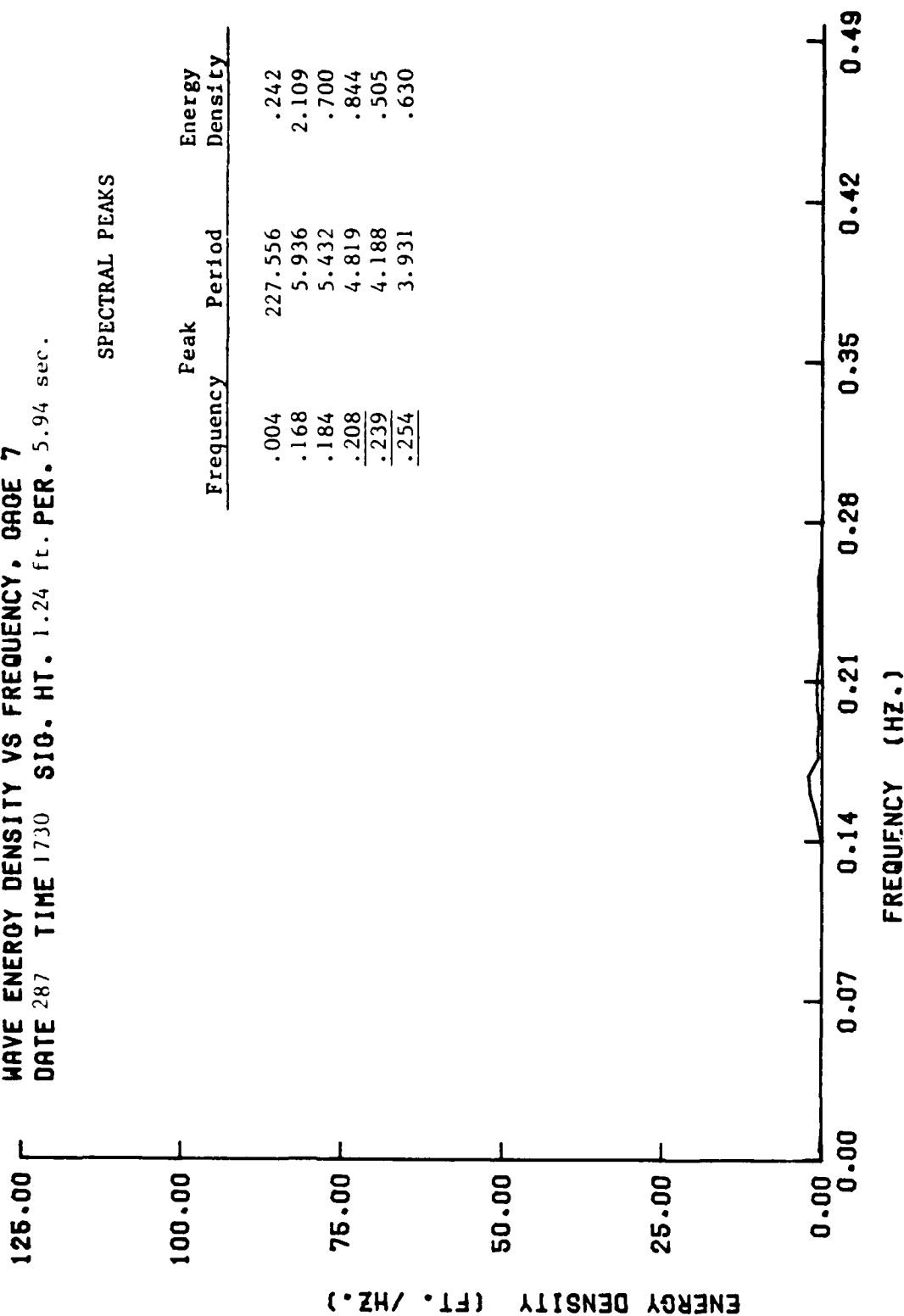
Peak		Energy	
Frequency	Period	Density	
.012	81.920	.471	
.051	19.505	.192	
.067	14.949	.072	
.161	6.225	73.769	
.192	5.211	29.796	
.208	4.819	17.456	
.239	4.188	8.150	
.254	3.931	6.908	
.270	3.703	5.861	



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7  
 DATE 287 TIME 1730 SIG. HT. 1.24 ft. PER. 5.94 sec.

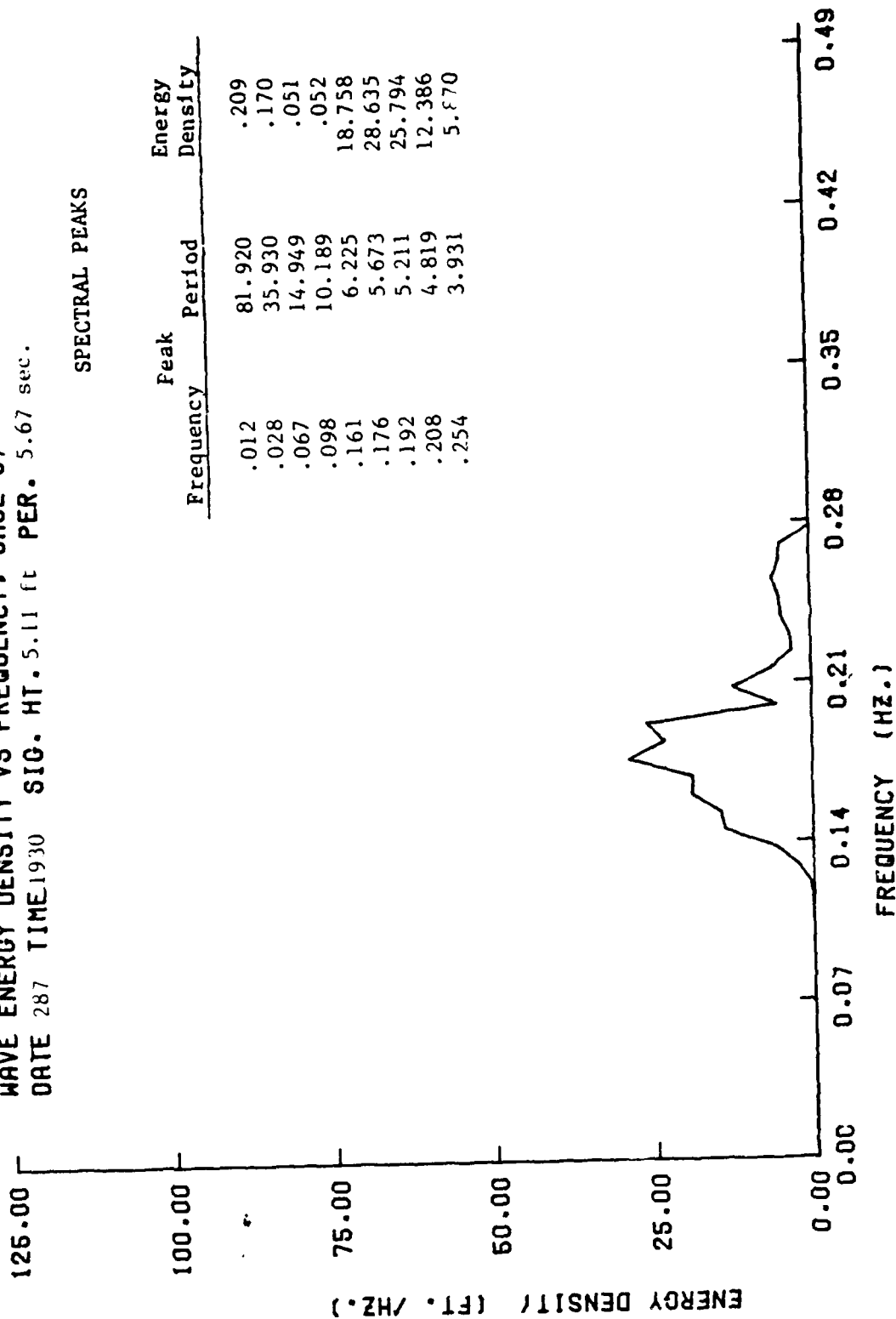
SPECTRAL PEAKS

Peak		Period	Energy Density
Frequency			
.004		227.556	.242
.168		5.936	2.109
.184		5.432	.700
.208		4.819	.844
<u>.239</u>		<u>4.188</u>	<u>.505</u>
<u>.254</u>		<u>3.931</u>	<u>.630</u>





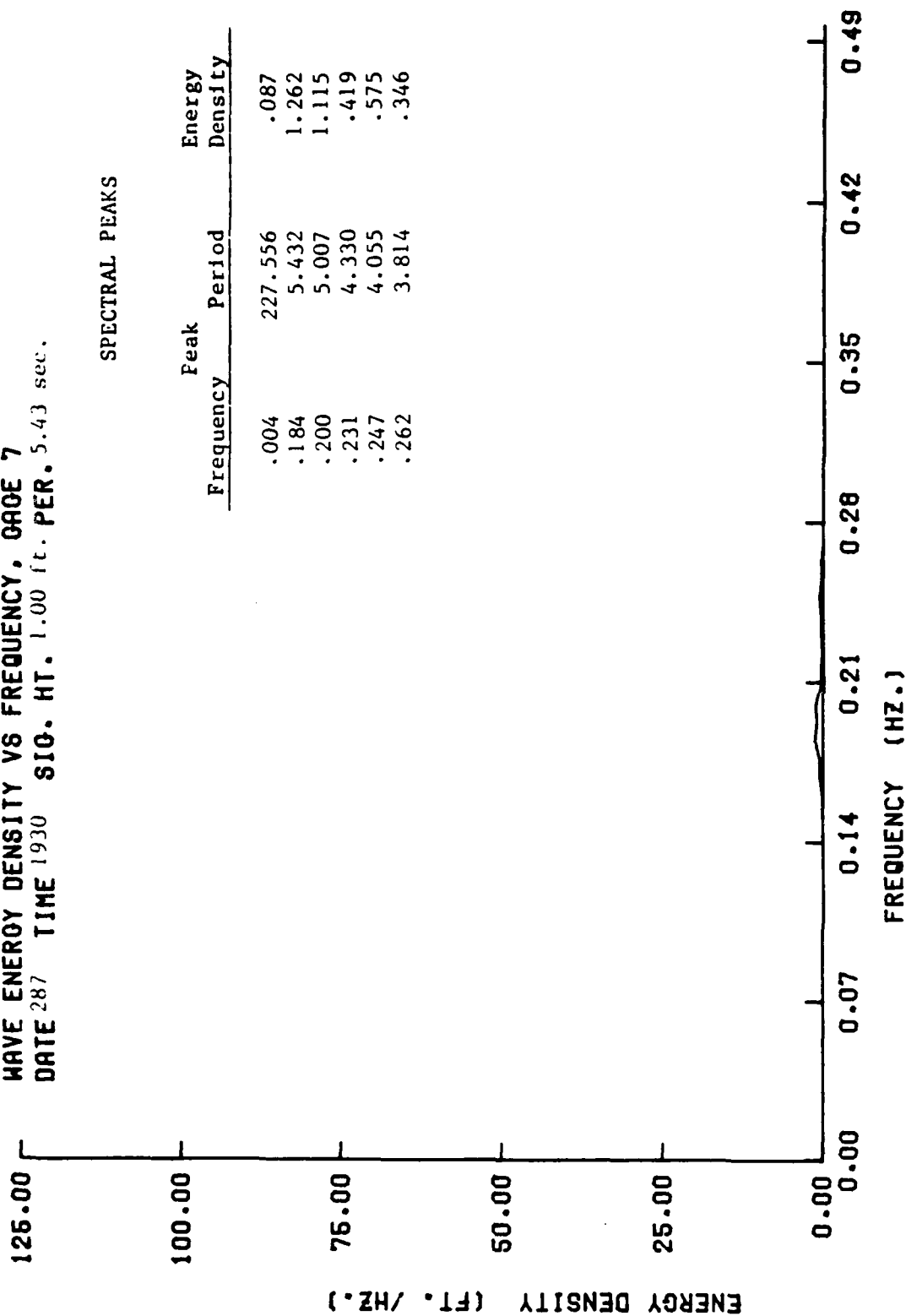
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
 DATE 287 TIME 1930 SIG. HT. 5.11 ft PER. 5.67 sec.



SPECTRAL PEAKS

Frequency	Peak	Period	Energy Density
.012		81.920	.209
.028		35.930	.170
.067		14.949	.051
.098		10.189	.052
.161		6.225	18.758
.176		5.673	28.635
.192		5.211	25.794
.208		4.819	12.386
.254		3.931	5.670

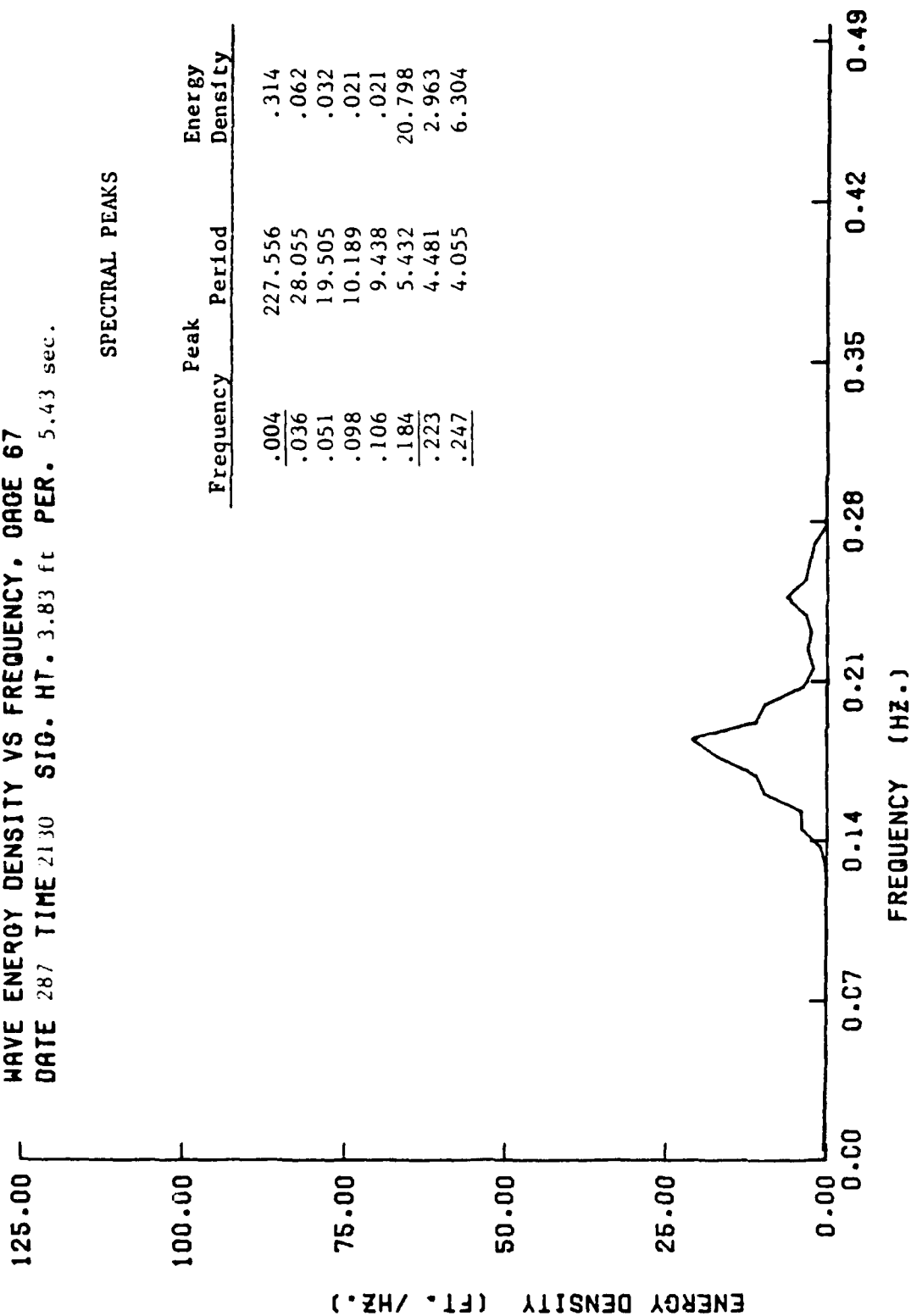
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7  
 DATE 287 TIME 1930 SIG. HT. 1.00 ft. PER. 5.43 sec.



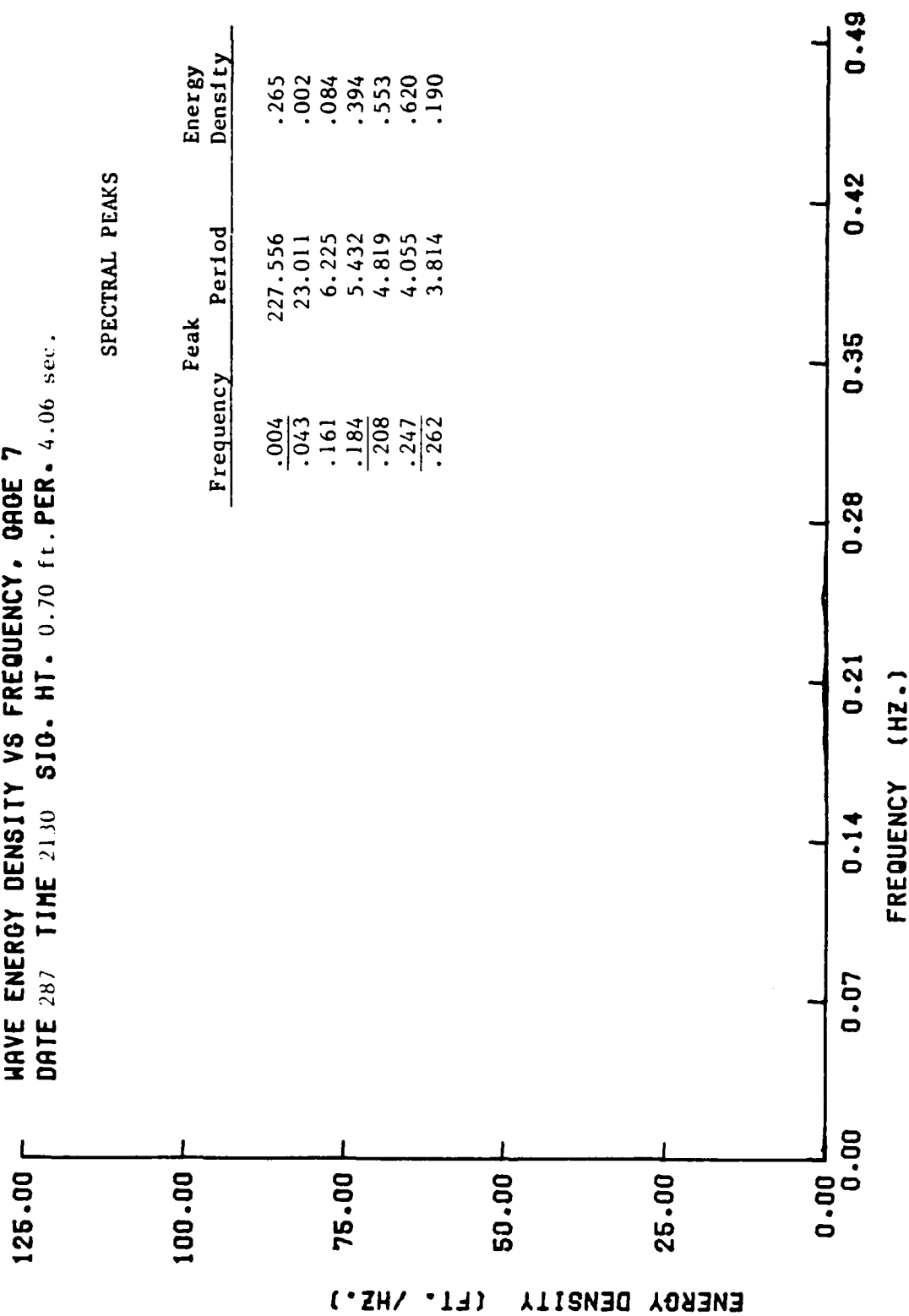
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GRADE 67  
 DATE 287 TIME 2130 SIG. HT. 3.83 ft PER. 5.43 sec.

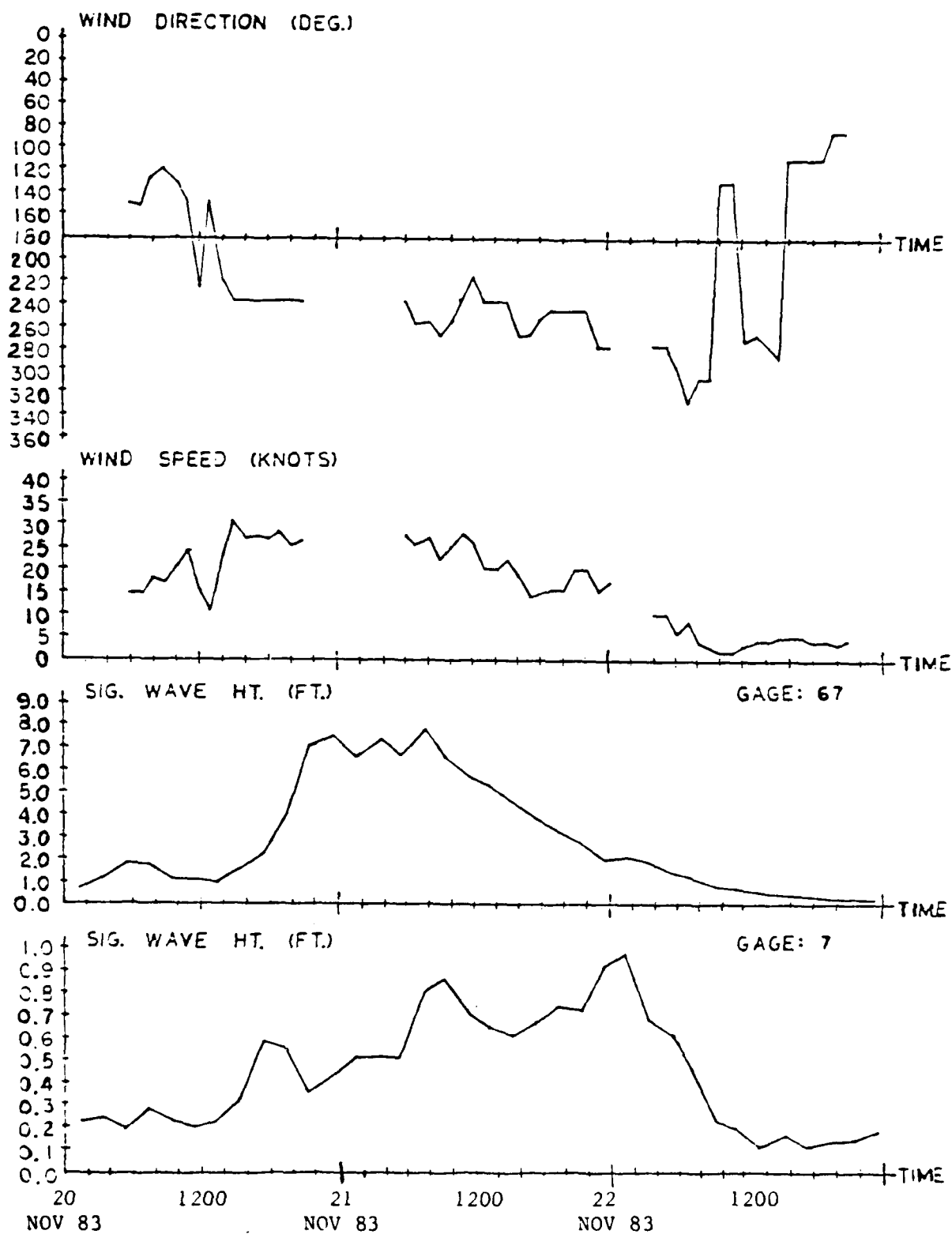
SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
<u>.004</u>	227.556	.314
<u>.036</u>	28.055	.062
<u>.051</u>	19.505	.032
<u>.098</u>	10.189	.021
<u>.106</u>	9.438	.021
<u>.184</u>	5.432	20.798
<u>.223</u>	4.481	2.963
<u>.247</u>	4.055	6.304



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7  
 DATE 287 TIME 2130 SIG. HT. 0.70 ft. PER. 4.06 sec.

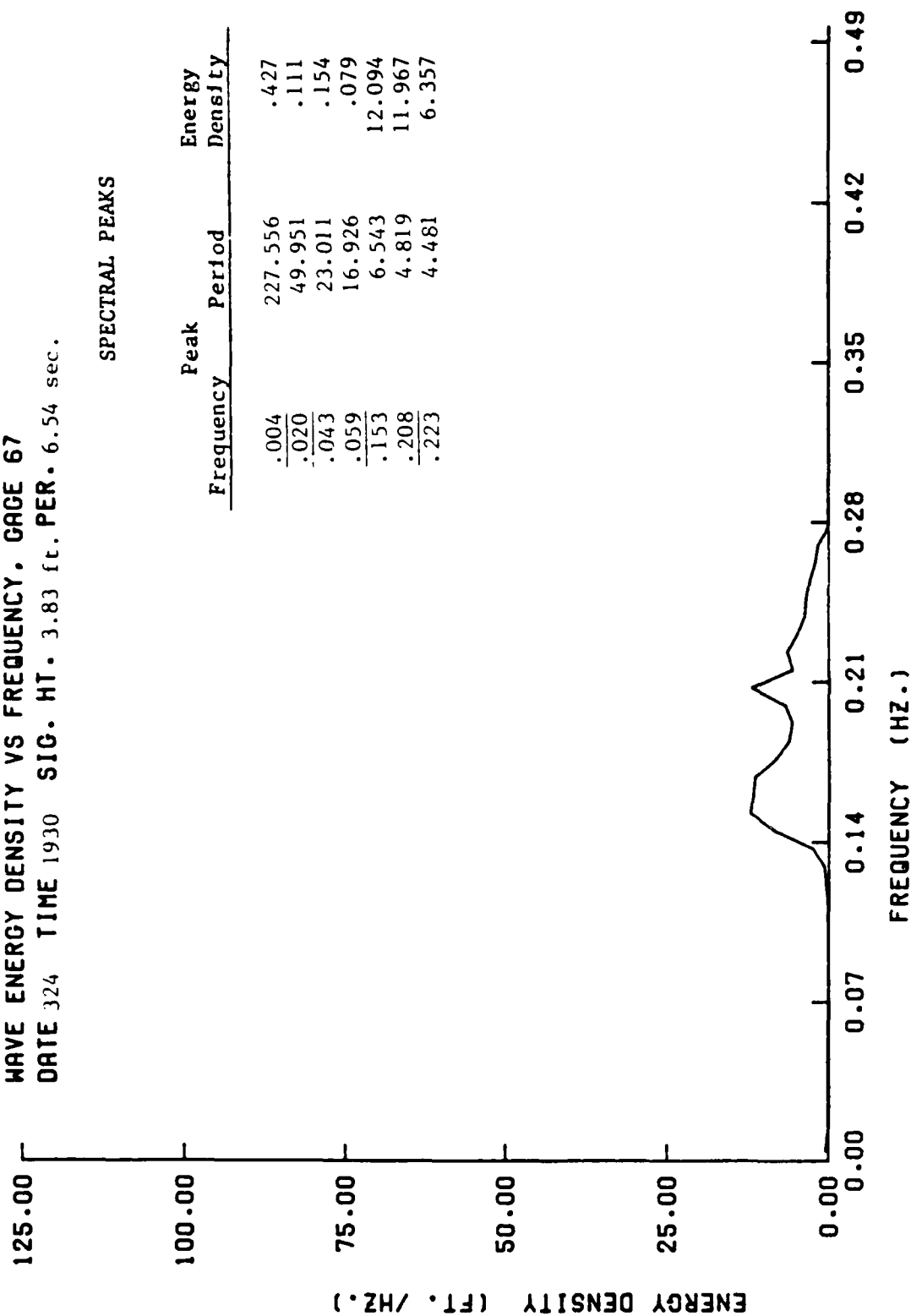




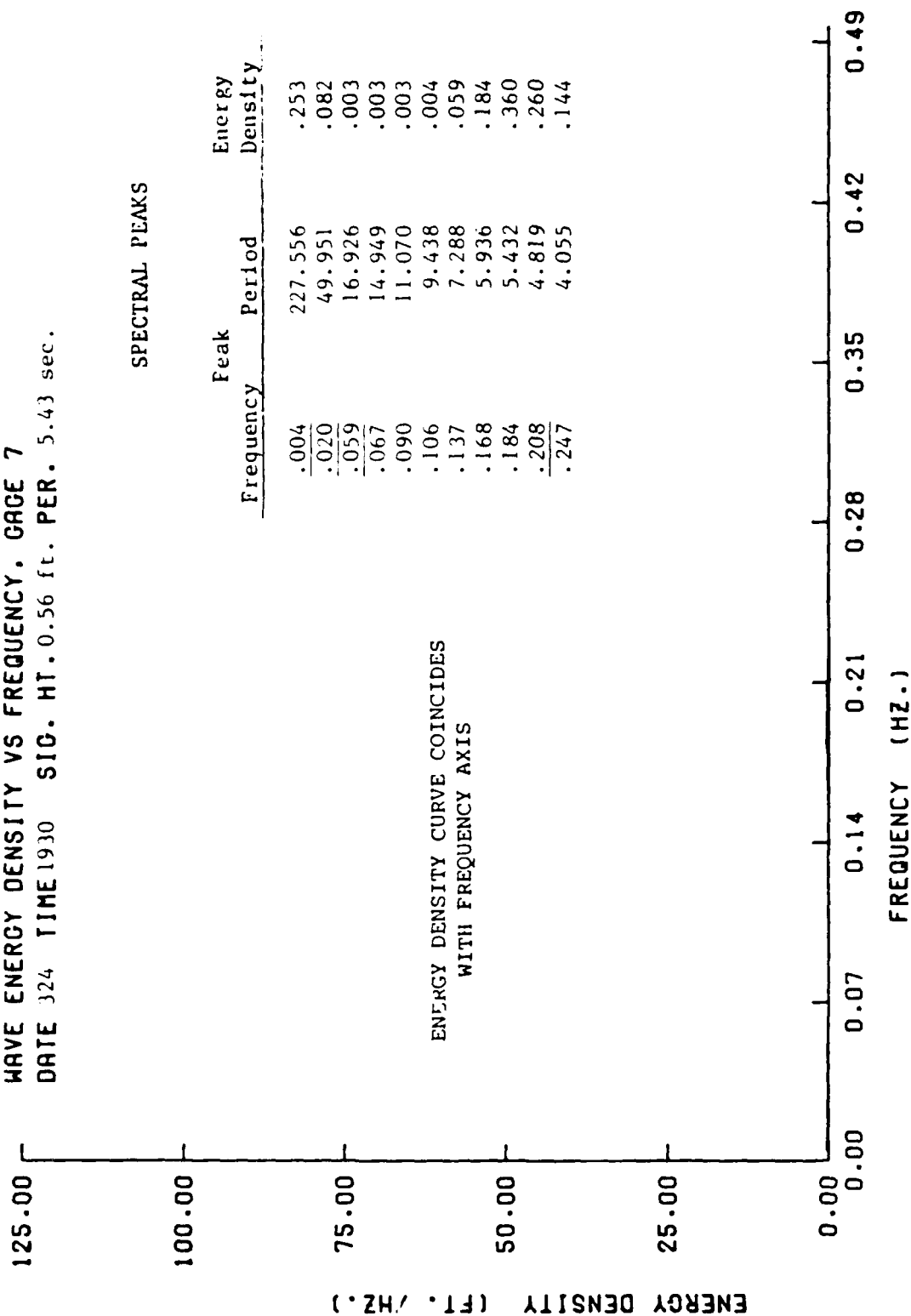
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
 DATE 324 TIME 1930 SIG. HT. 3.83 ft. PER. 6.54 sec.

SPECTRAL PEAKS

Frequency	Peak	Period	Energy
			Density
.004	227.556		.427
.020	49.951		.111
.043	23.011		.154
.059	16.926		.079
.153	6.543		12.094
.208	4.819		11.967
.223	4.481		6.357



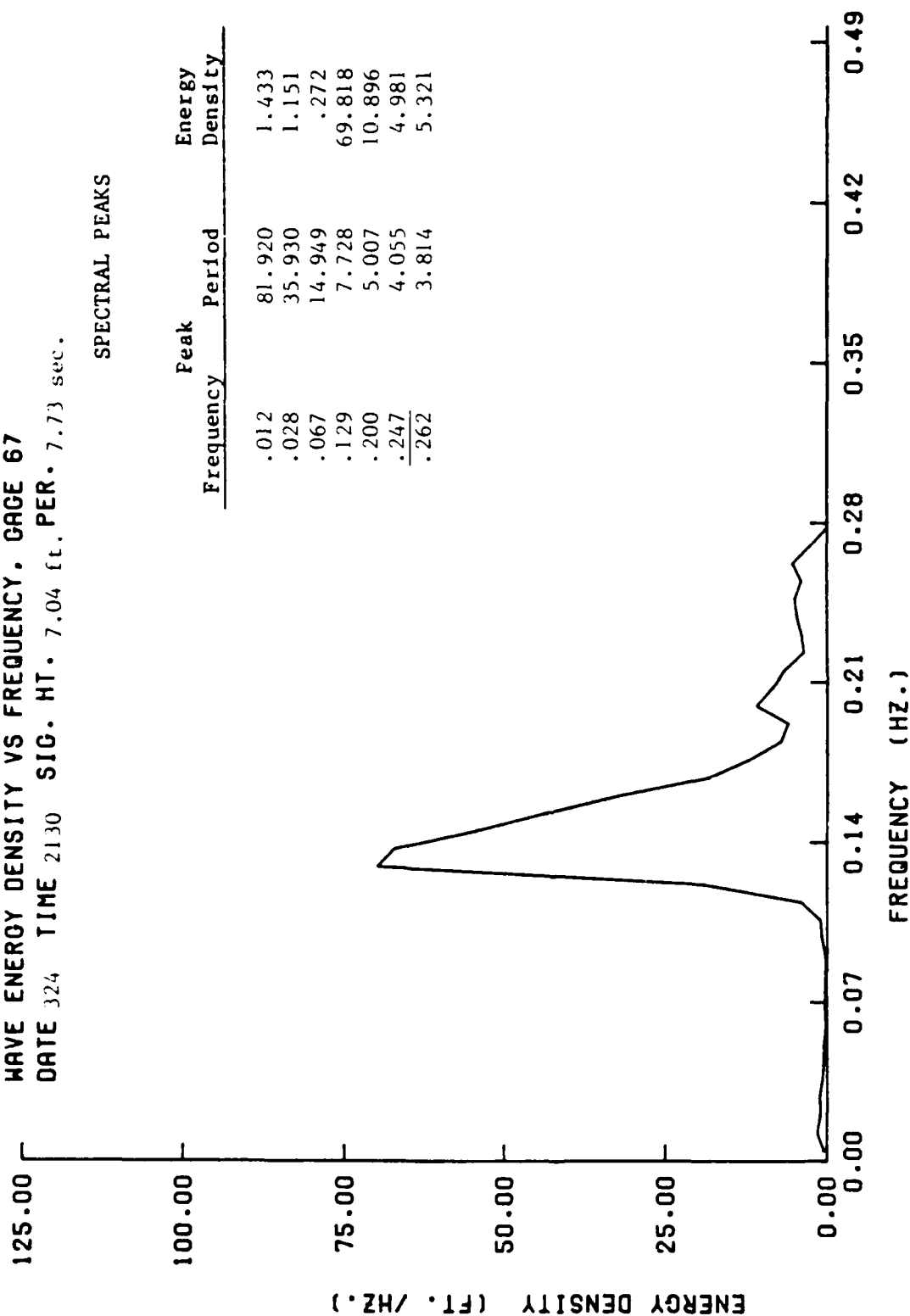
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY. GAGE 7  
 DATE 324 TIME 1930 SIG. HT. 0.56 ft. PER. 5.43 sec.



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
 DATE 324 TIME 2130 SIG. HT. 7.04 ft., PER. 7.73 sec.

SPECTRAL PEAKS

Peak		Period	Energy Density
Frequency			
.012		81.920	1.433
.028		35.930	1.151
.067		14.949	.272
.129		7.728	69.818
.200		5.007	10.896
.247		4.055	4.981
.262		3.814	5.321

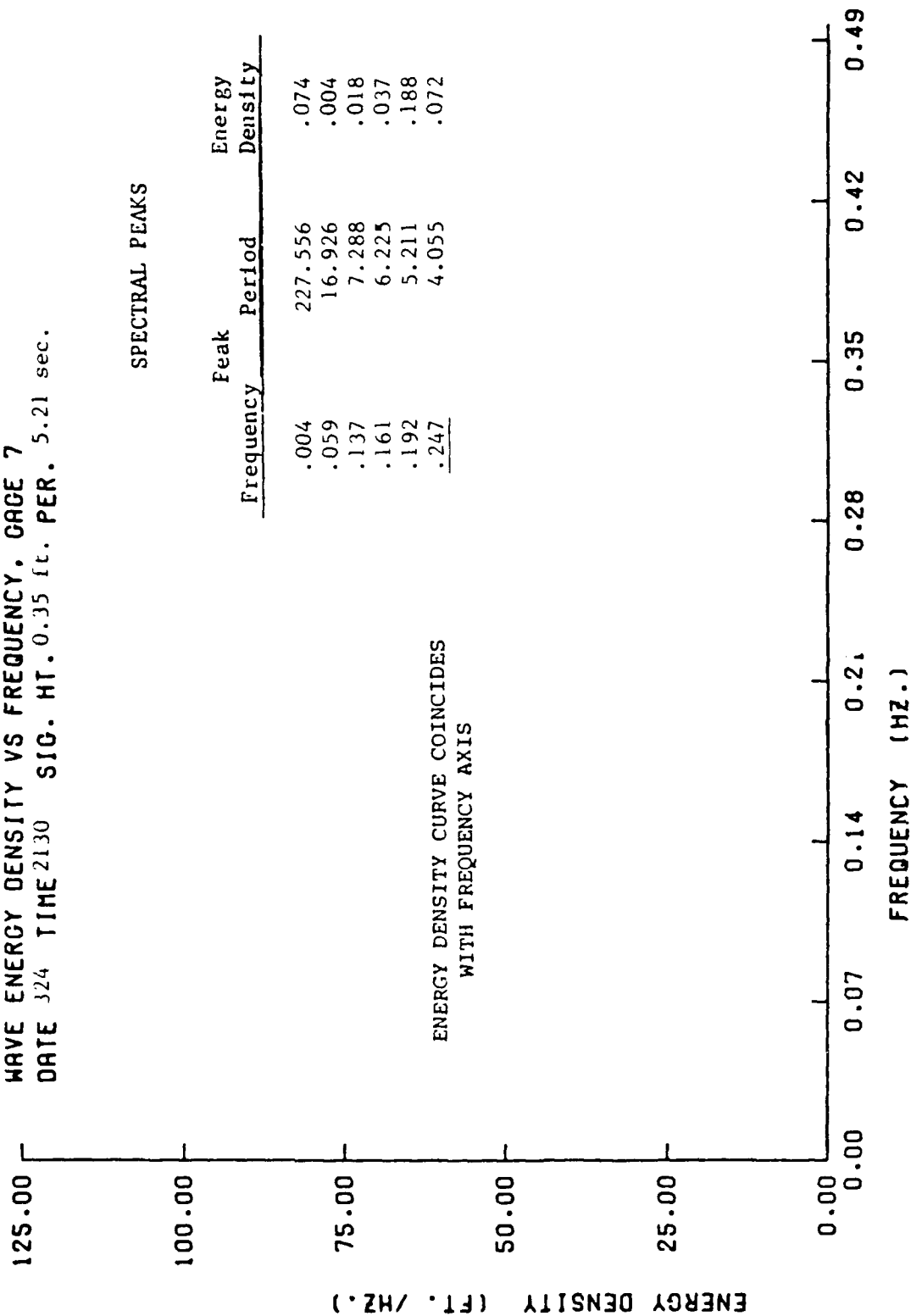




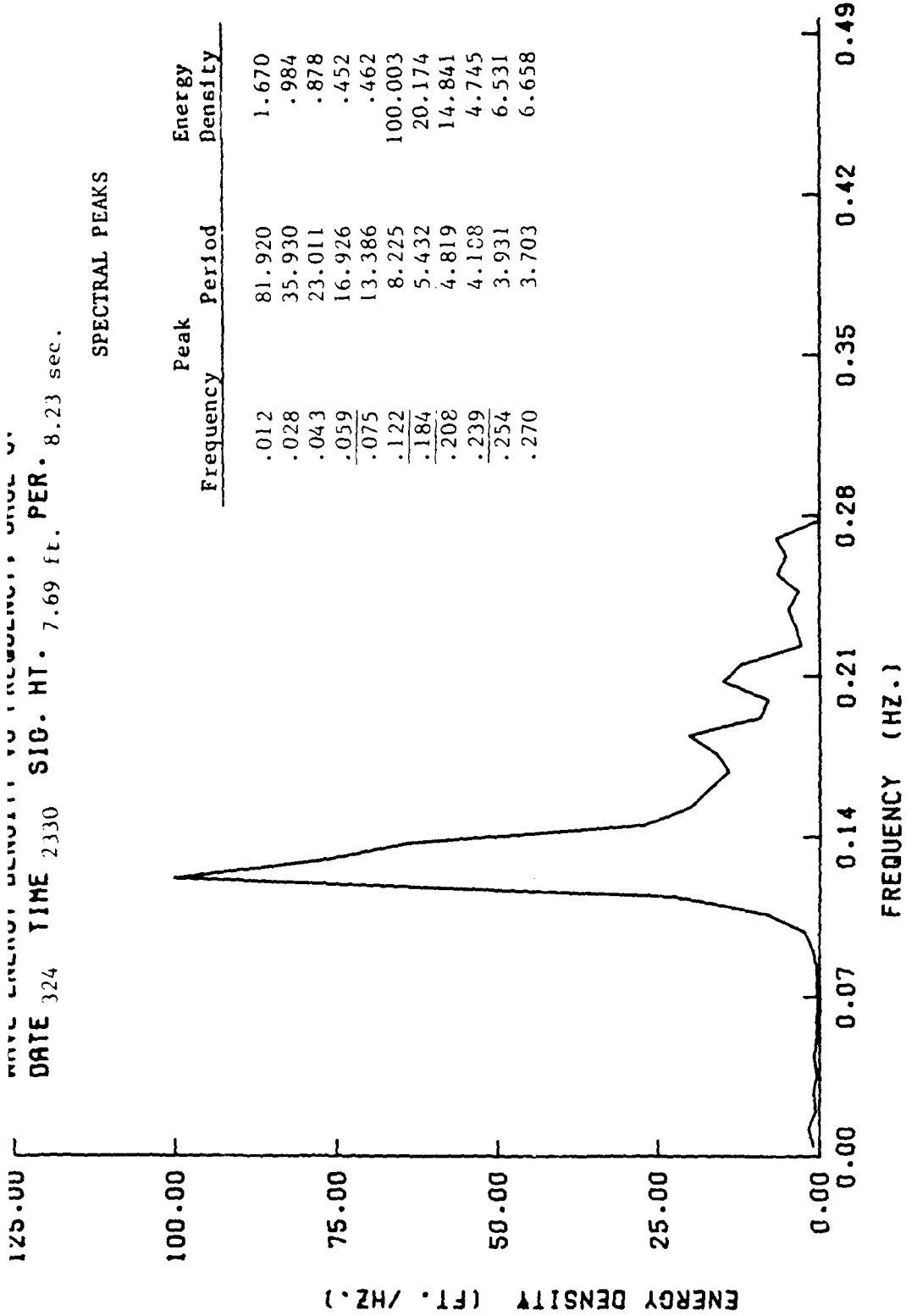
# LUDINGTON HARBOR, MICHIGAN

WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7

DATE 324 TIME 2130 SIG. HT. 0.35 ft. PER. 5.21 sec.



DATE 324 TIME 2330 SIG. HT. 7.69 ft. PER. 8.23 sec.



SPECTRAL PEAKS

Frequency	Peak	Period	Energy Density
.012		81.920	1.670
.028		35.930	.984
.043		23.011	.878
.059		16.926	.452
.075		13.386	.462
.122		8.225	100.003
.184		5.432	20.174
.208		4.819	14.841
.239		4.168	4.745
.254		3.931	6.531
.270		3.703	6.658

AD-A157 074

WAVE CLIMATOLOGY STUDY FOR LUDINGTON HARBOR MICHIGAN  
(U) COASTAL ENGINEERING RESEARCH CENTER VICKSBURG MS  
G M HORSHAM JUN 85 CERC-85-7

2/2

UNCLASSIFIED

F/G 8/8

NL

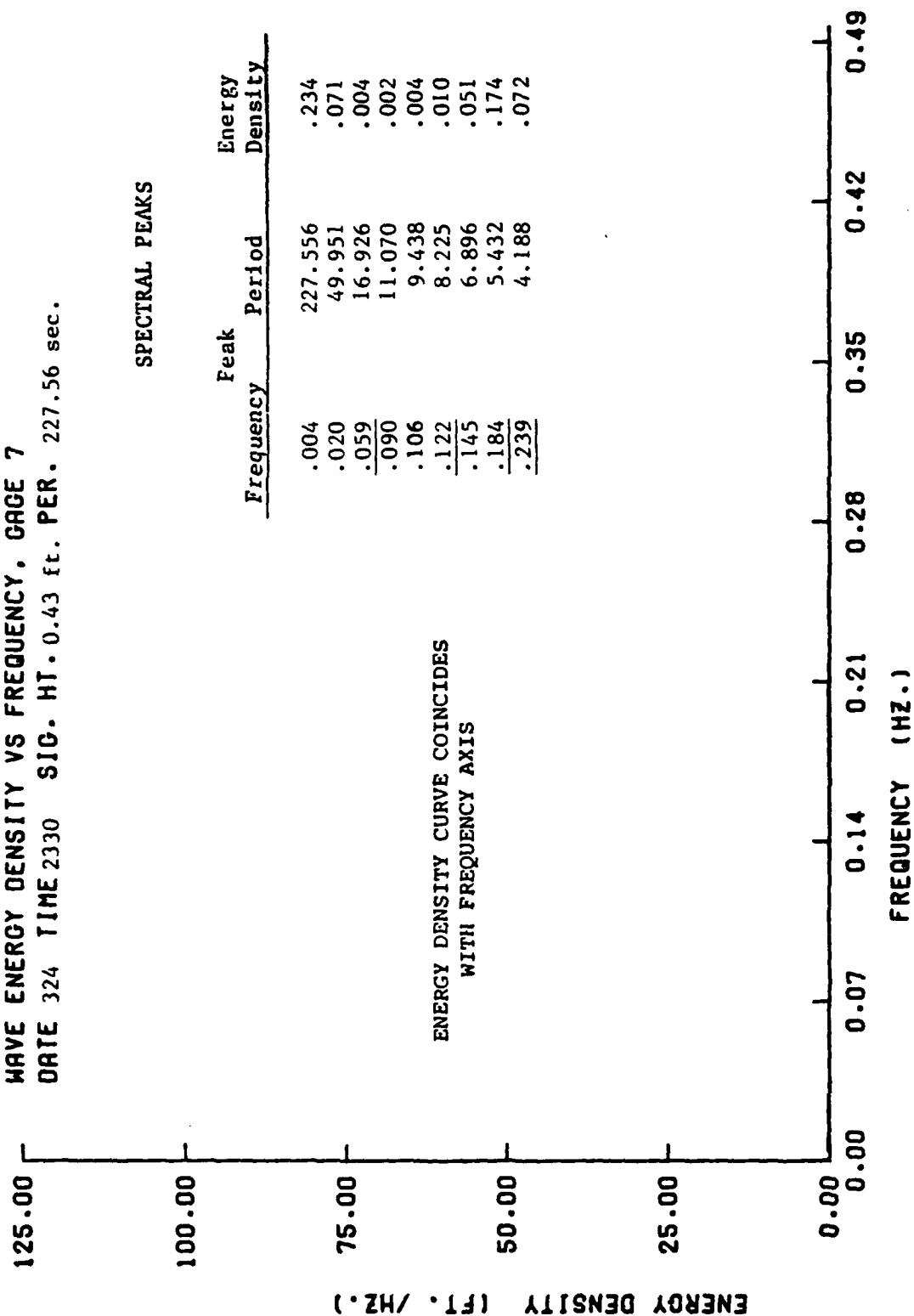
END

Fig. 401.13



MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

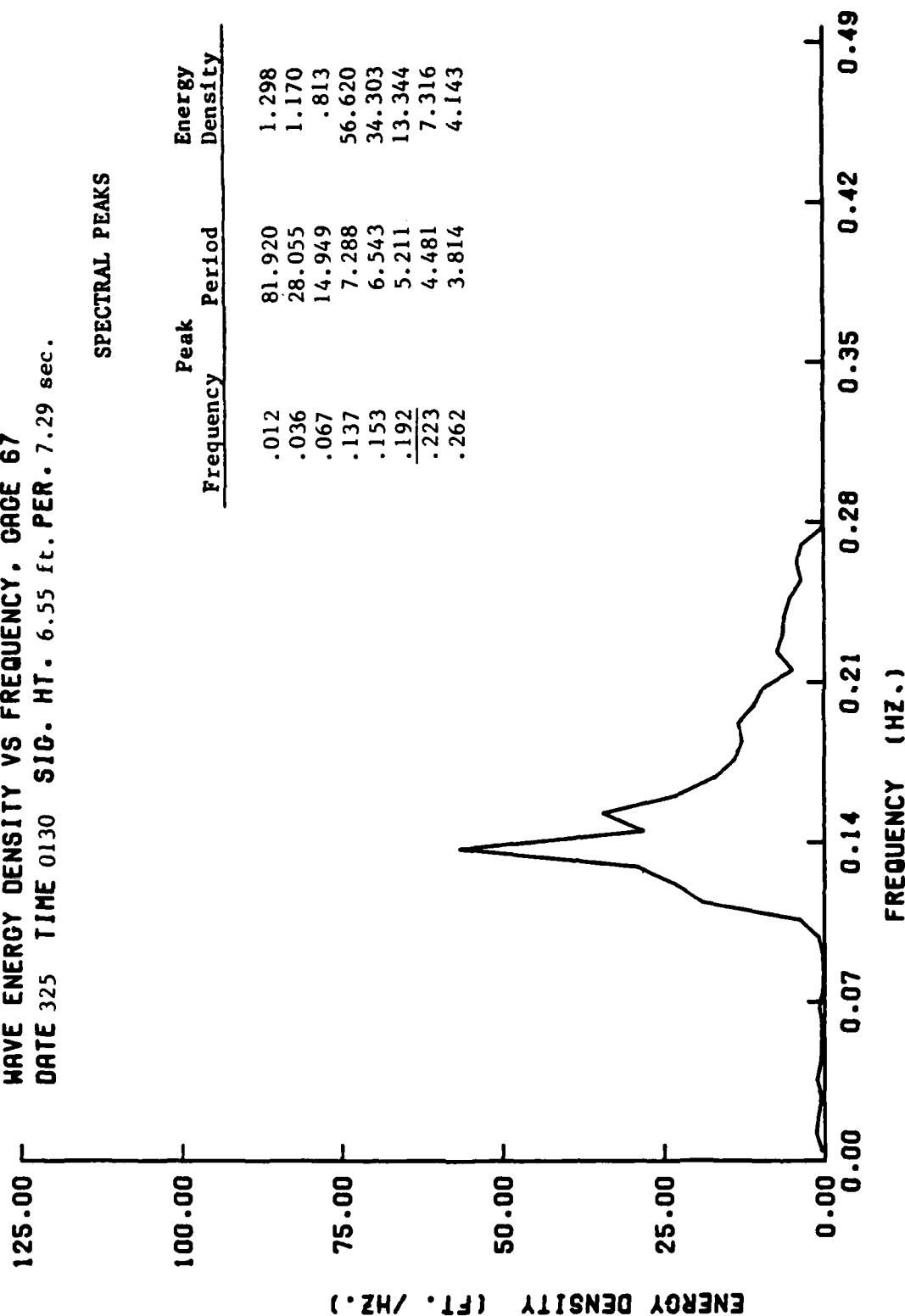
LUDINGTON HARBOR.MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY. GAGE 7  
 DATE 324 TIME 2330 SIG. HT. 0.43 ft. PER. 227.56 sec.



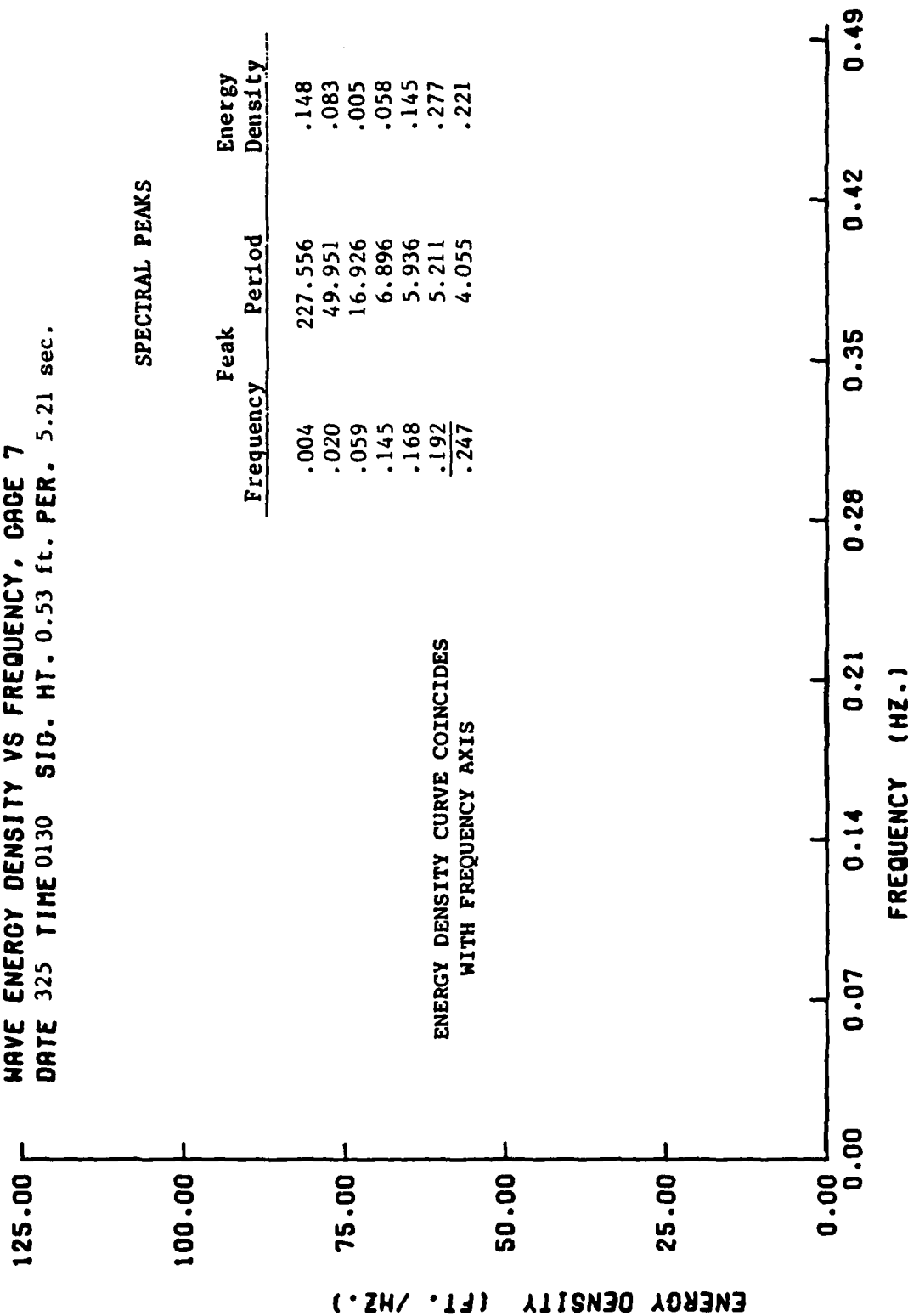
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
 DATE 325 TIME 0130 SIG. HT. 6.55 ft. PER. 7.29 sec.

SPECTRAL PEAKS

Peak		Period	Energy Density
Frequency			
.012		81.920	1.298
.036		28.055	1.170
.067		14.949	.813
.137		7.288	56.620
.153		6.543	34.303
.192		5.211	13.344
.223		4.481	7.316
.262		3.814	4.143

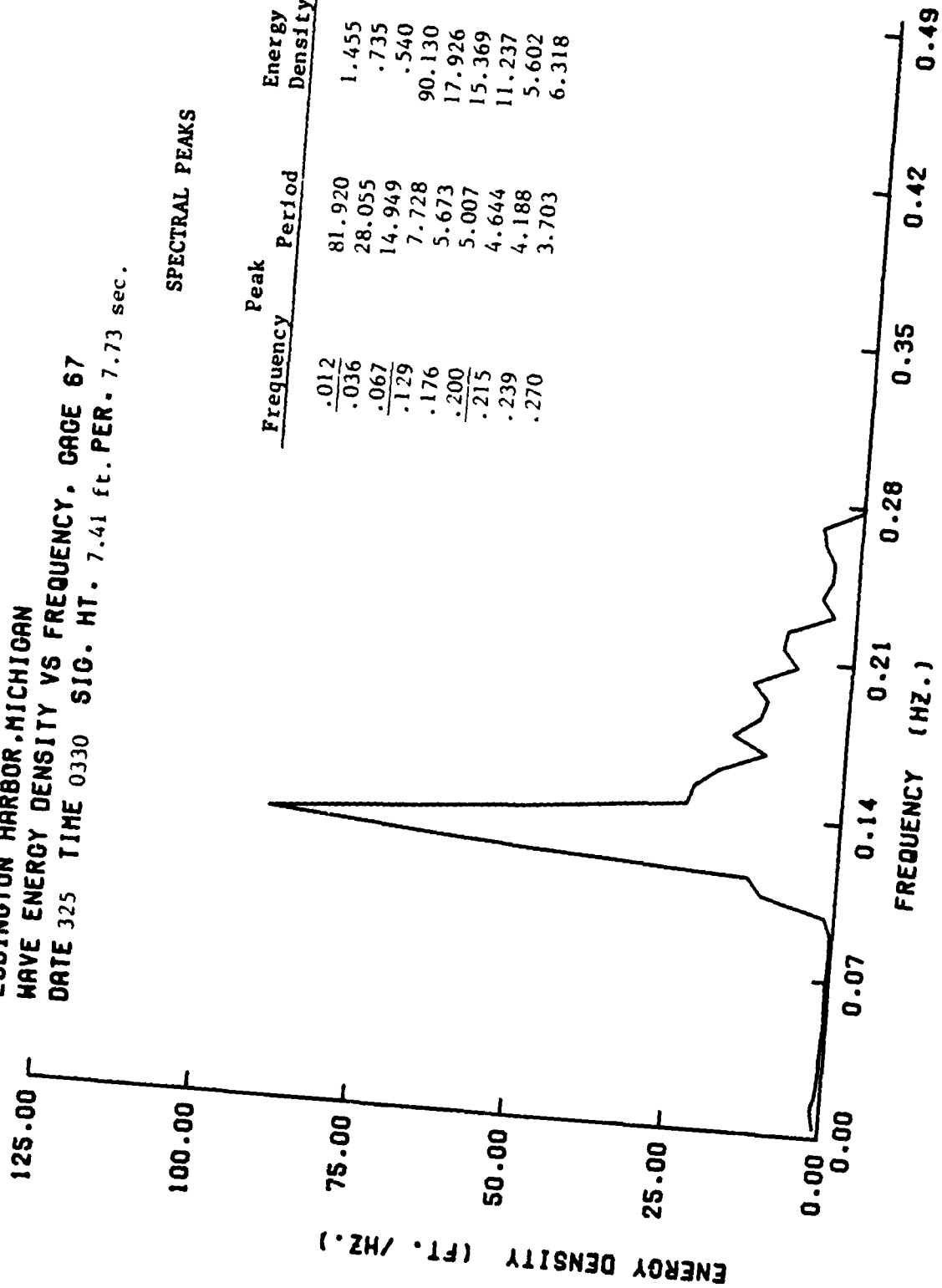


LUDINGTON HARBOR.MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7  
 DATE 325 TIME 0130 SIG. HT. 0.53 ft. PER. 5.21 sec.



SPECTRAL PEAKS

LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
 DATE 325 TIME 0330 SIG. HT. 7.41 ft. PER. 7.73 sec.

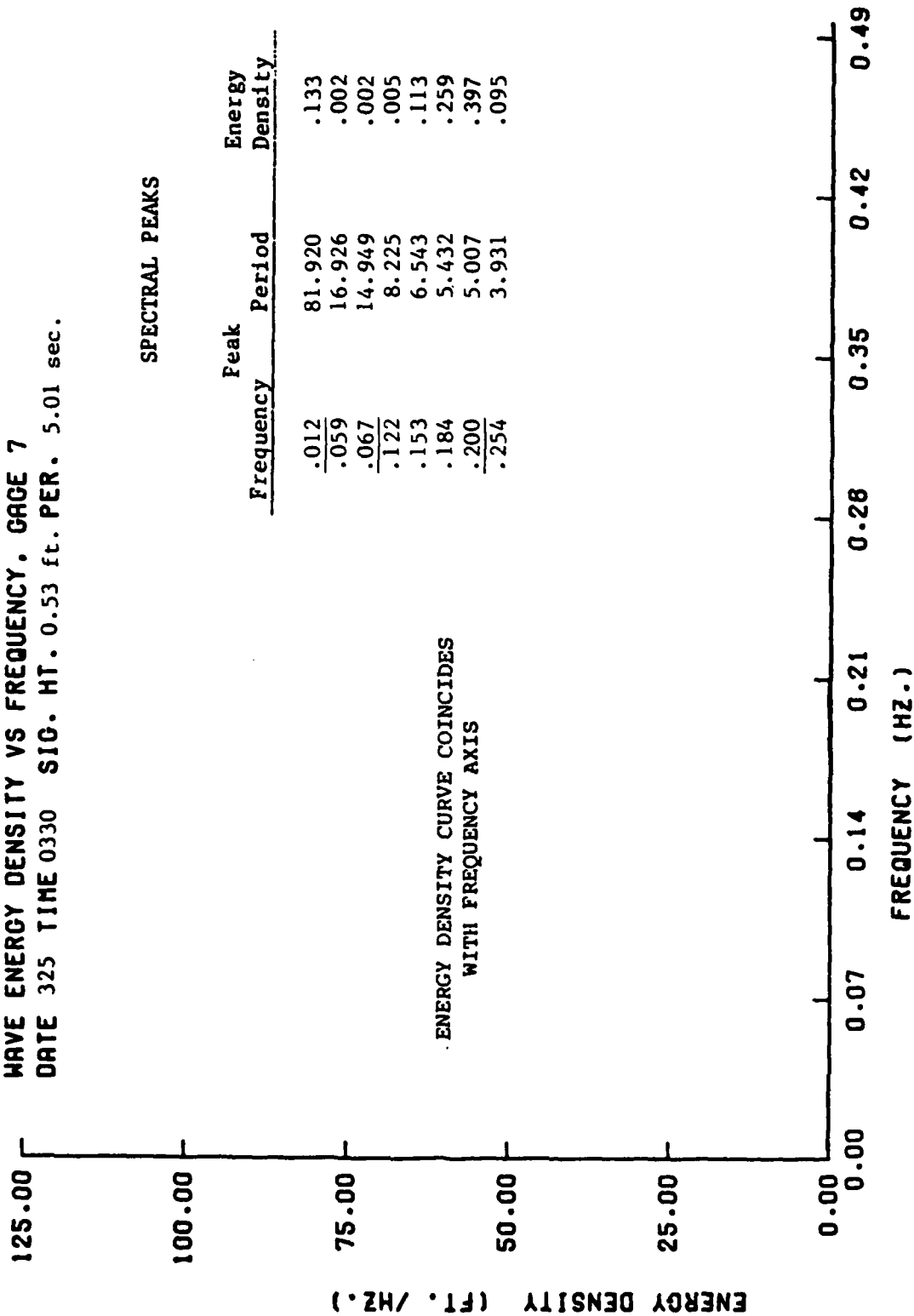


SPECTRAL PEAKS

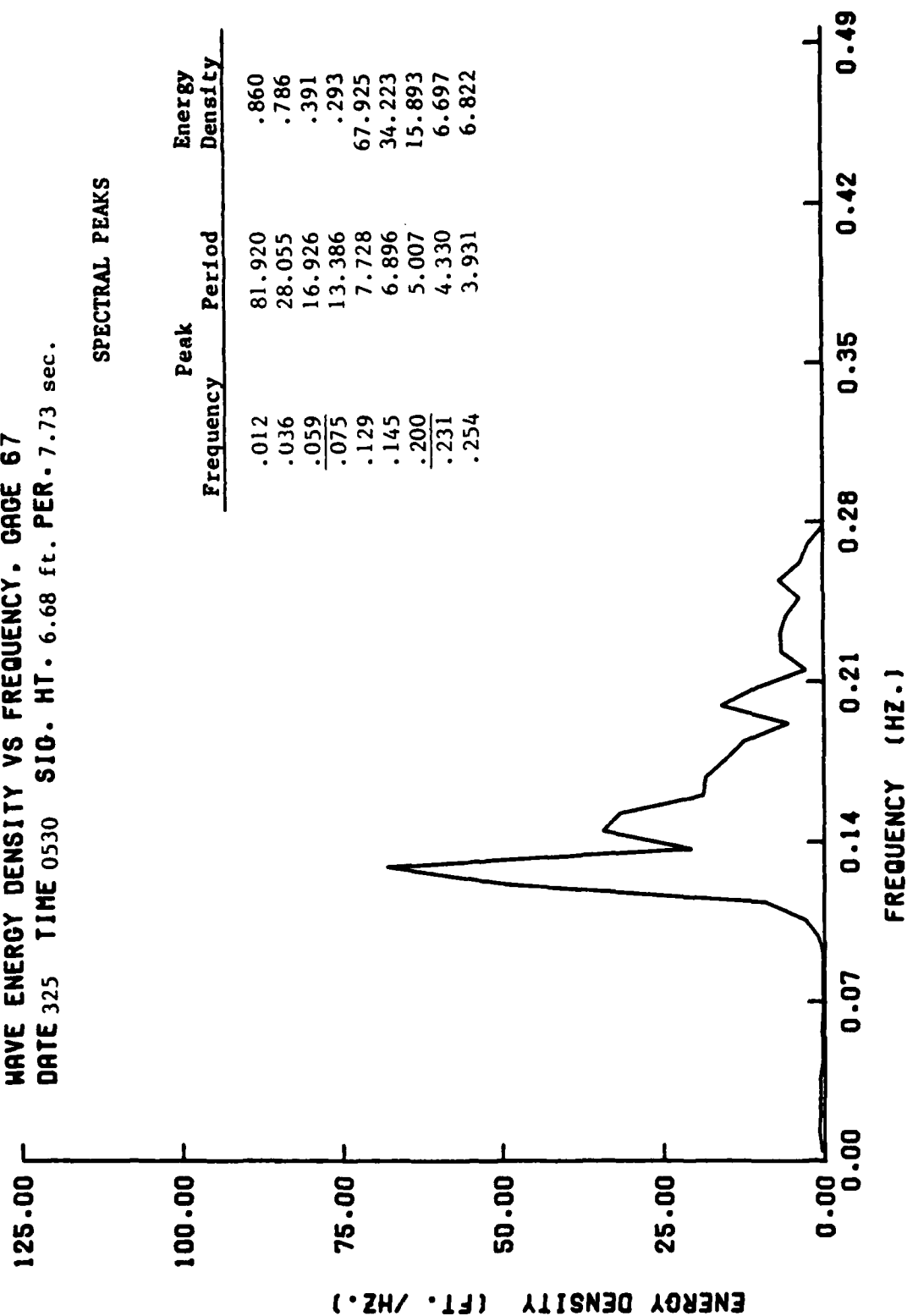
Frequency	Peak	Period	Energy Density
.012		81.920	1.455
.036		28.055	.735
.067		14.949	.540
.129		7.728	90.130
.176		5.673	17.926
.200		5.007	15.369
.215		4.644	11.237
.239		4.188	5.602
.270		3.703	6.318



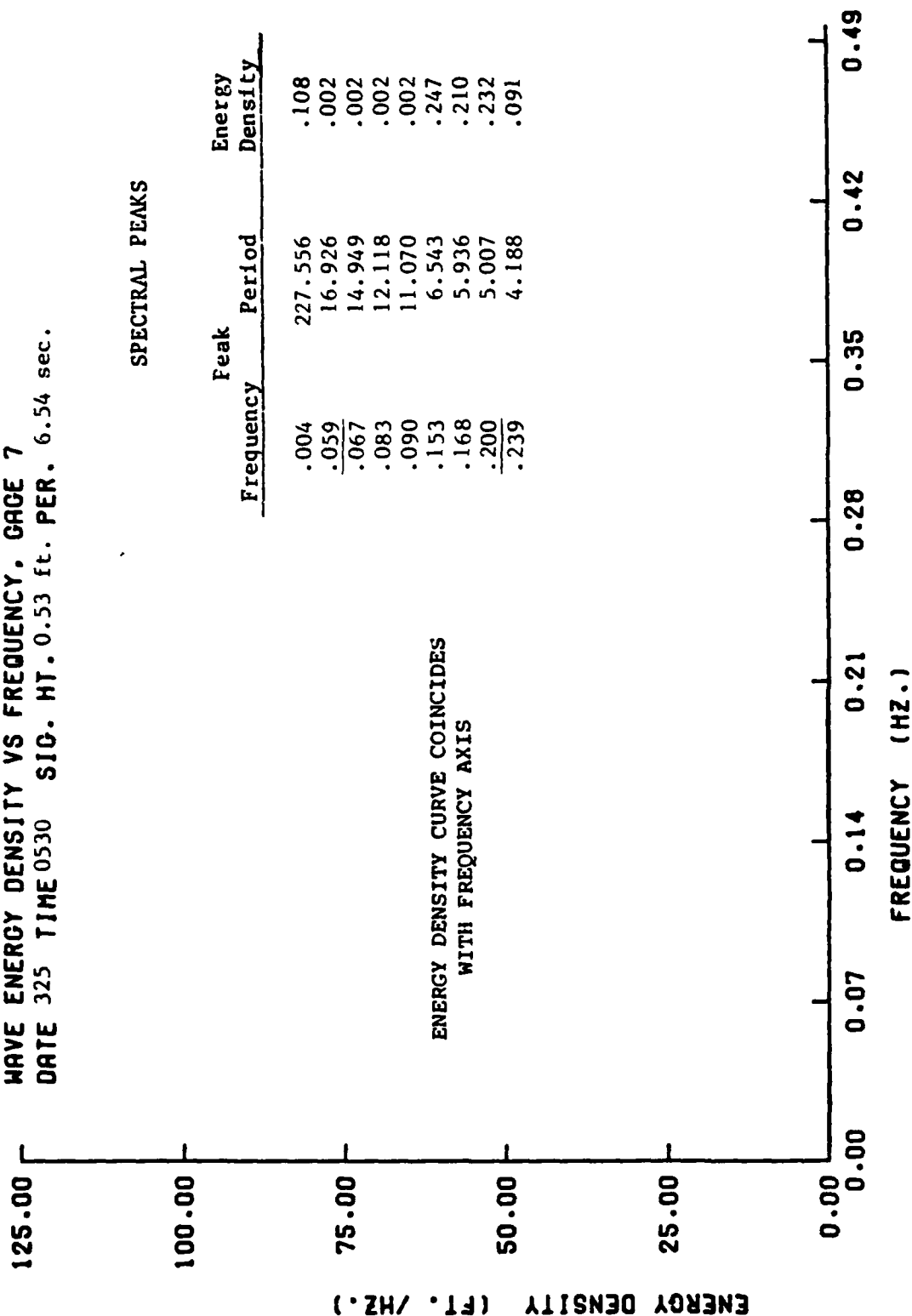
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7  
 DATE 325 TIME 0330 SIG. HT. 0.53 ft. PER. 5.01 sec.



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY. GAGE 67  
 DATE 325 TIME 0530 SIO. HT. 6.68 ft. PER. 7.73 sec.



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7  
 DATE 325 TIME 0530 SIG. HT. 0.53 ft. PER. 6.54 sec.

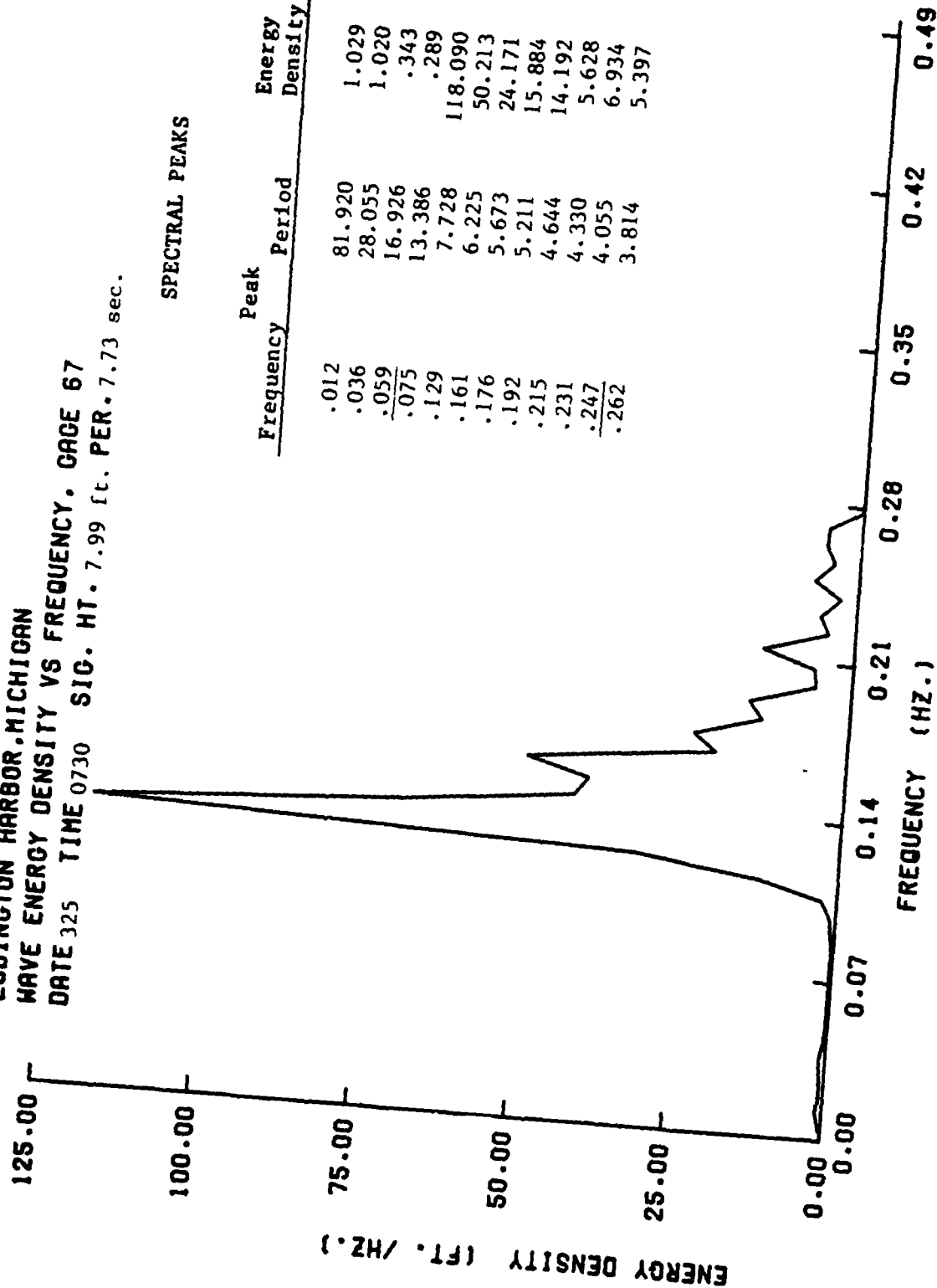


SPECTRAL PEAKS

Frequency	Peak Period	Energy Density
.004	227.556	.108
.059	16.926	.002
.067	14.949	.002
.083	12.118	.002
.090	11.070	.002
.153	6.543	.247
.168	5.936	.210
.200	5.007	.232
.239	4.188	.091

# LUDINGTON HARBOR, MICHIGAN

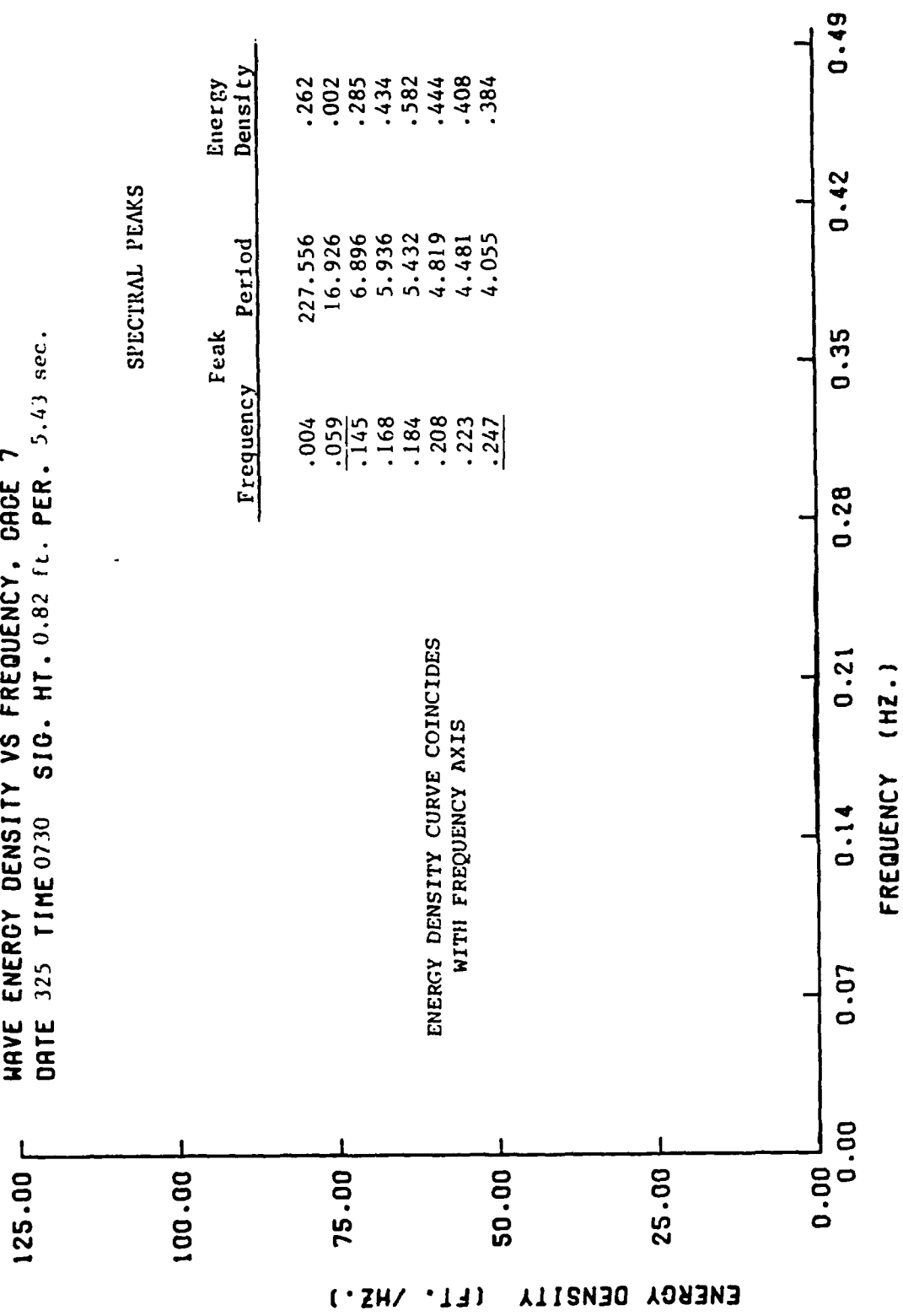
WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
DATE 325 TIME 0730 SIG. HT. 7.99 ft. PER. 7.73 sec.



## SPECTRAL PEAKS

Peak		
Frequency	Period	Energy Density
.012	81.920	118.090
.036	28.055	50.213
.059	16.926	24.171
.075	13.386	15.884
.129	7.728	14.192
.161	6.225	5.628
.176	5.673	6.934
.192	5.211	5.397
.215	4.644	
.231	4.330	
.247	4.055	
.262	3.814	

LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7  
 DATE 325 TIME 0730 SIG. HT. 0.82 ft. PER. 5.43 sec.



SPECTRAL PEAKS

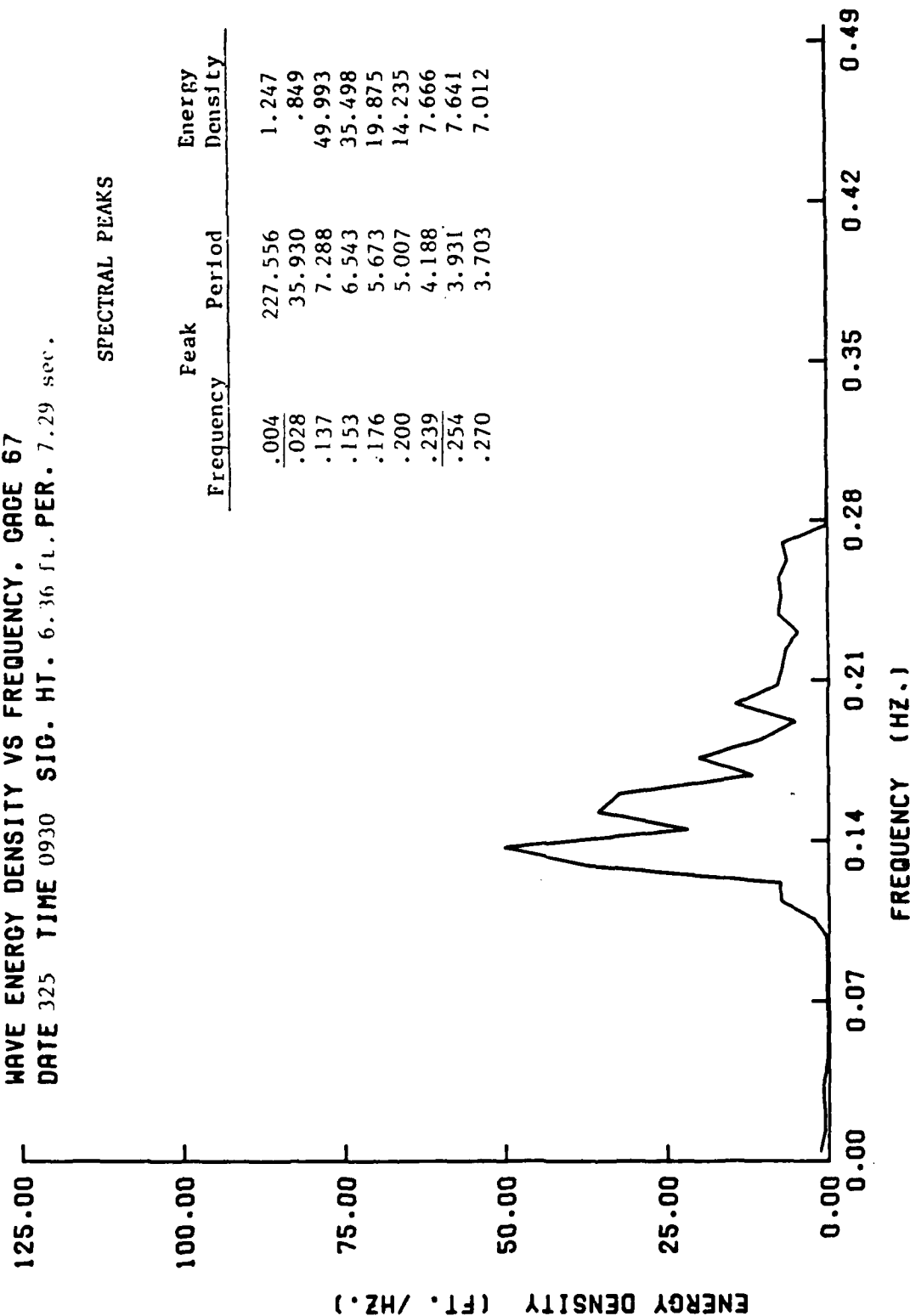
Frequency	Peak Period	Energy Density
.004	227.556	.262
.059	16.926	.002
.145	6.896	.285
.168	5.936	.434
.184	5.432	.582
.208	4.819	.444
.223	4.481	.408
.247	4.055	.384

ENERGY DENSITY CURVE COINCIDES  
 WITH FREQUENCY AXIS

LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY. GAGE 67  
 DATE 325 TIME 0930 SIG. HT. 6.36 ft. PER. 7.29 sec.

SPECTRAL PEAKS

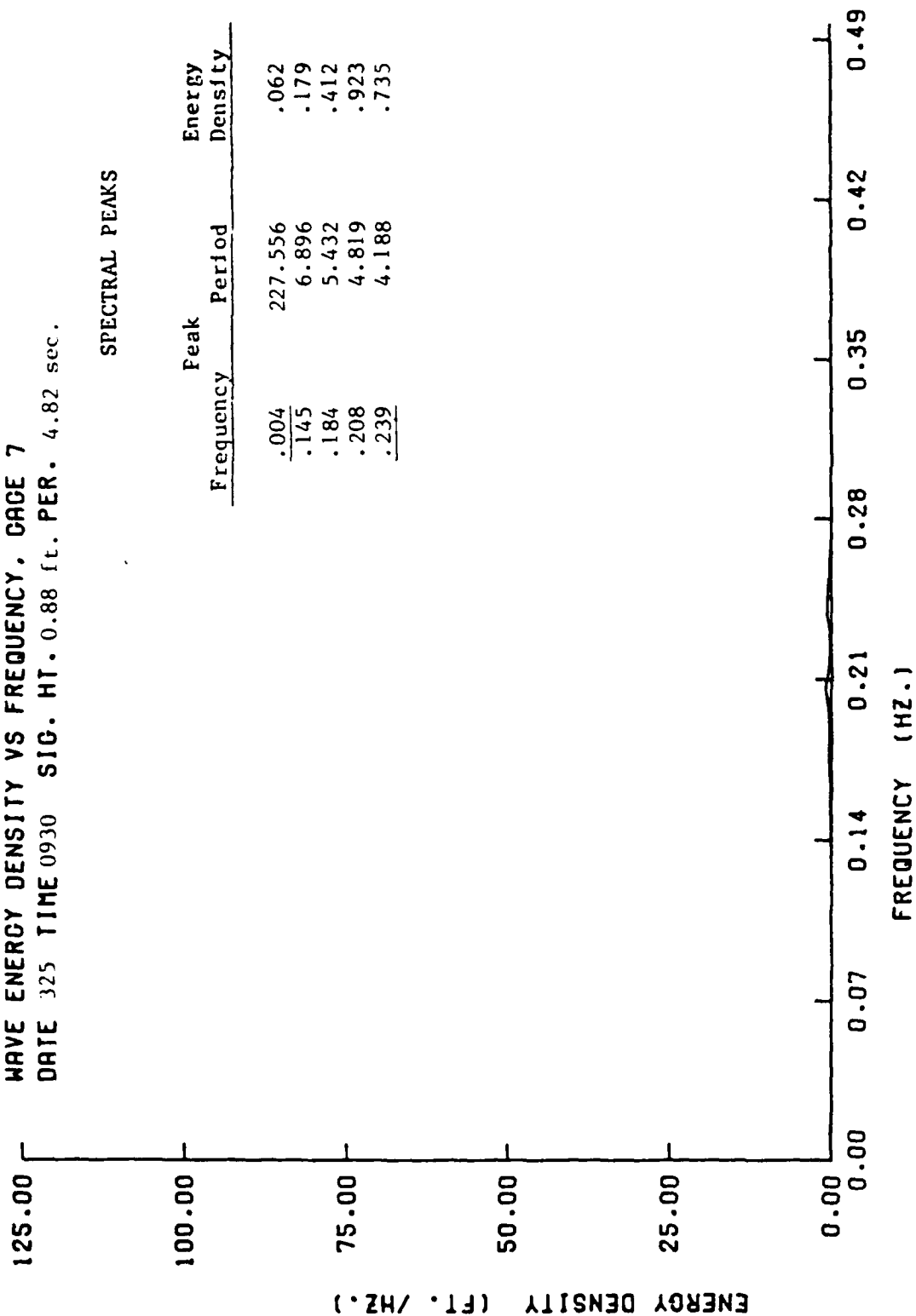
Peak		Energy Density
Frequency	Period	
.004	227.556	1.247
.028	35.930	.849
.137	7.288	49.993
.153	6.543	35.498
.176	5.673	19.875
.200	5.007	14.235
.239	4.188	7.666
.254	3.931	7.641
.270	3.703	7.012



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7  
 DATE 325 TIME 0930 SIG. HT. 0.88 ft. PER. 4.82 sec.

SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
.004	227.556	.062
.145	6.896	.179
.184	5.432	.412
.208	4.819	.923
.239	4.188	.735



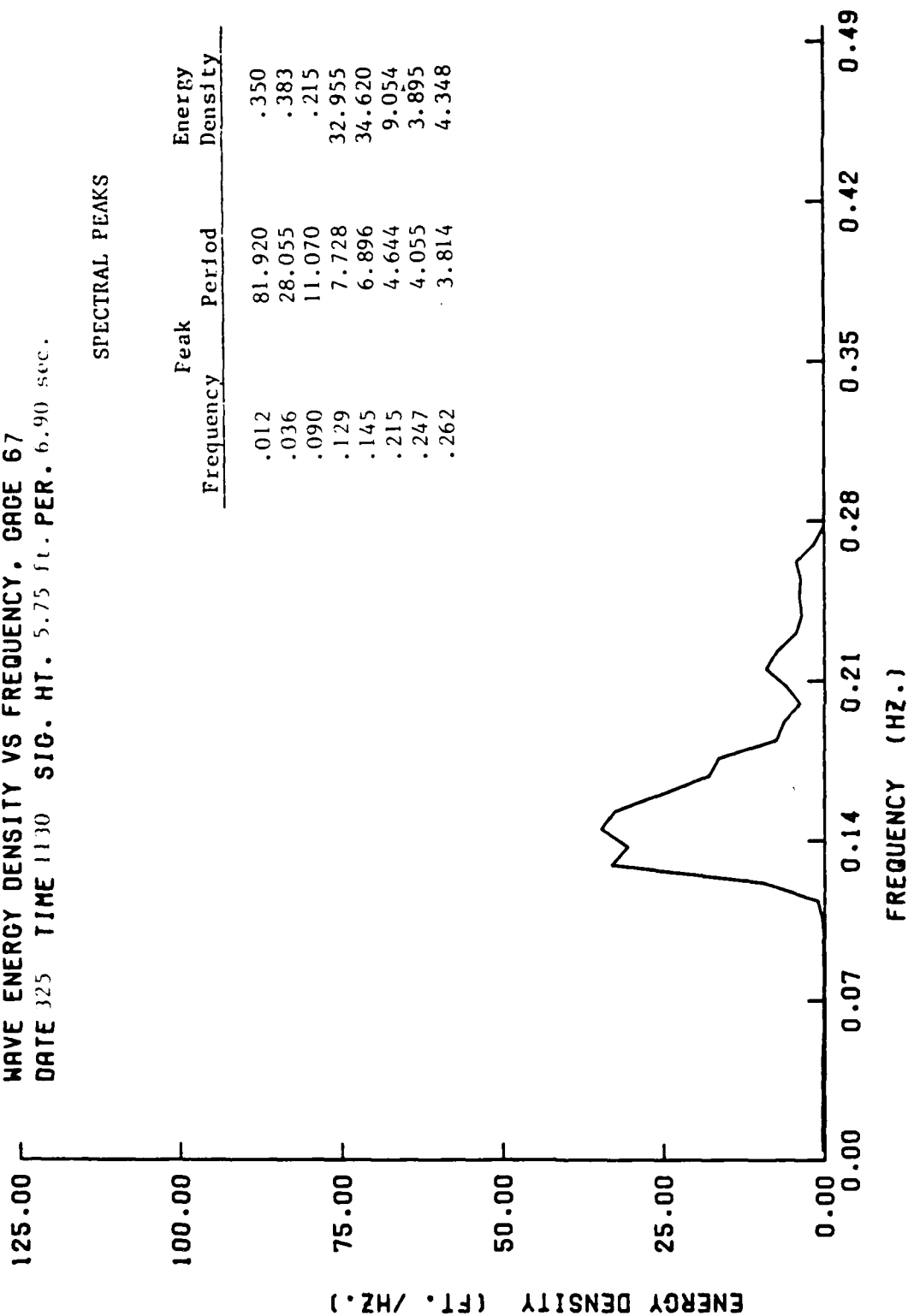
# LUDINGTON HARBOR, MICHIGAN

WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67

DATE 325 TIME 1130 SIG. HT. 5.75 ft. PER. 6.90 sec.

## SPECTRAL PEAKS

Frequency	Peak Period	Energy Density
.012	81.920	.350
.036	28.055	.383
.090	11.070	.215
.129	7.728	32.955
.145	6.896	34.620
.215	4.644	9.054
.247	4.055	3.895
.262	3.814	4.348

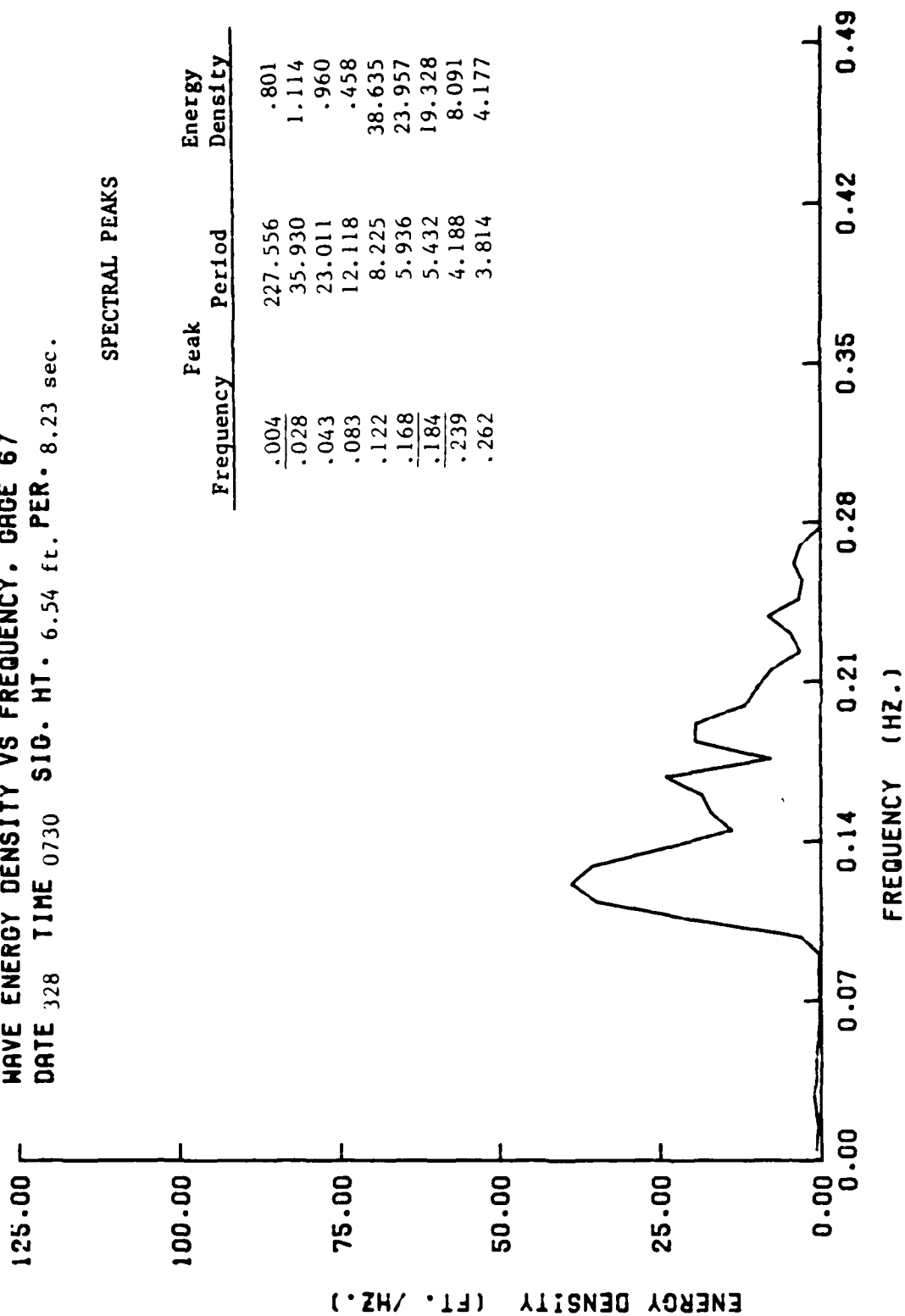




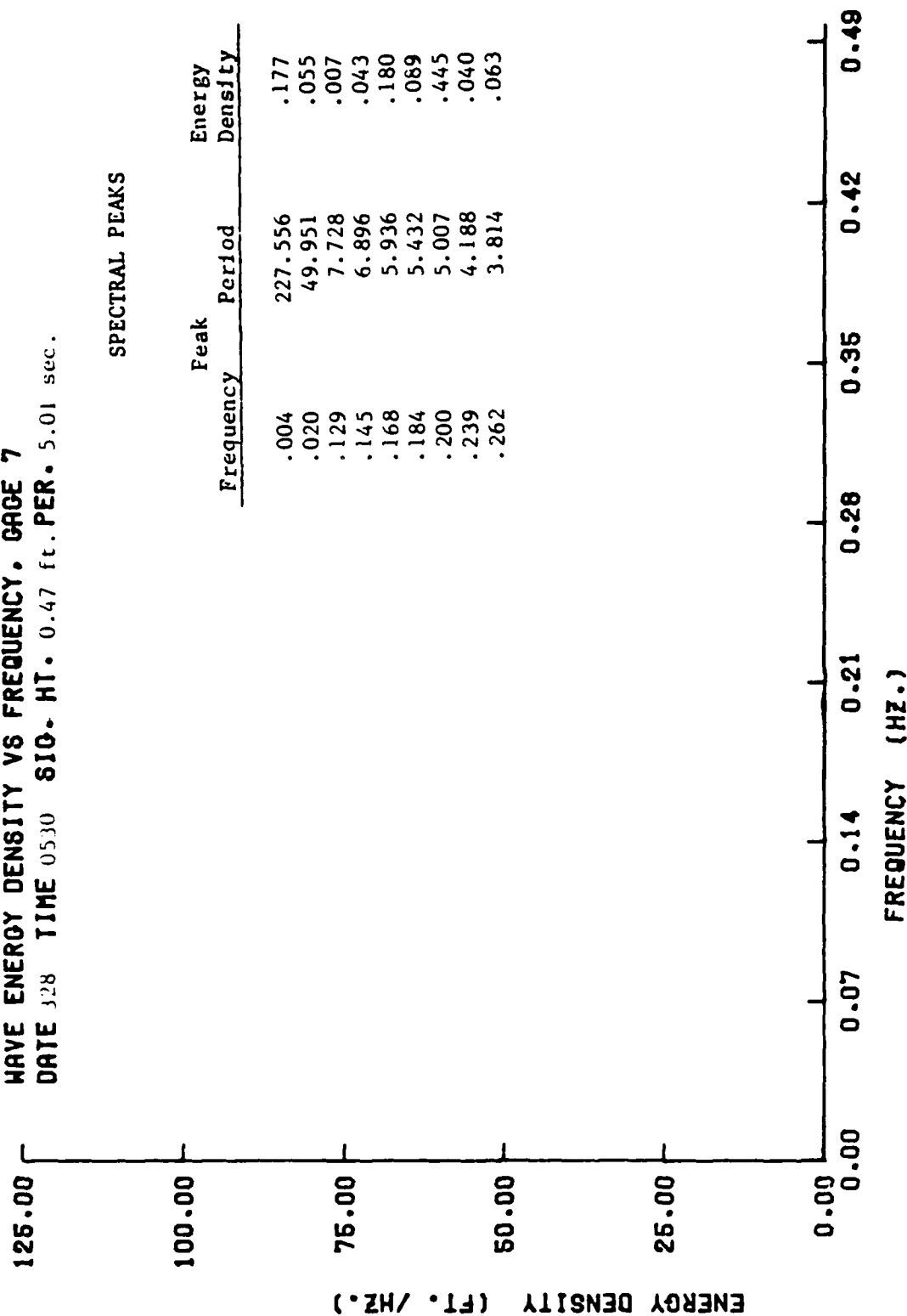
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY. GAGE 67  
 DATE 328 TIME 0730 SIG. HT. 6.54 ft. PER. 8.23 sec.

SPECTRAL PEAKS

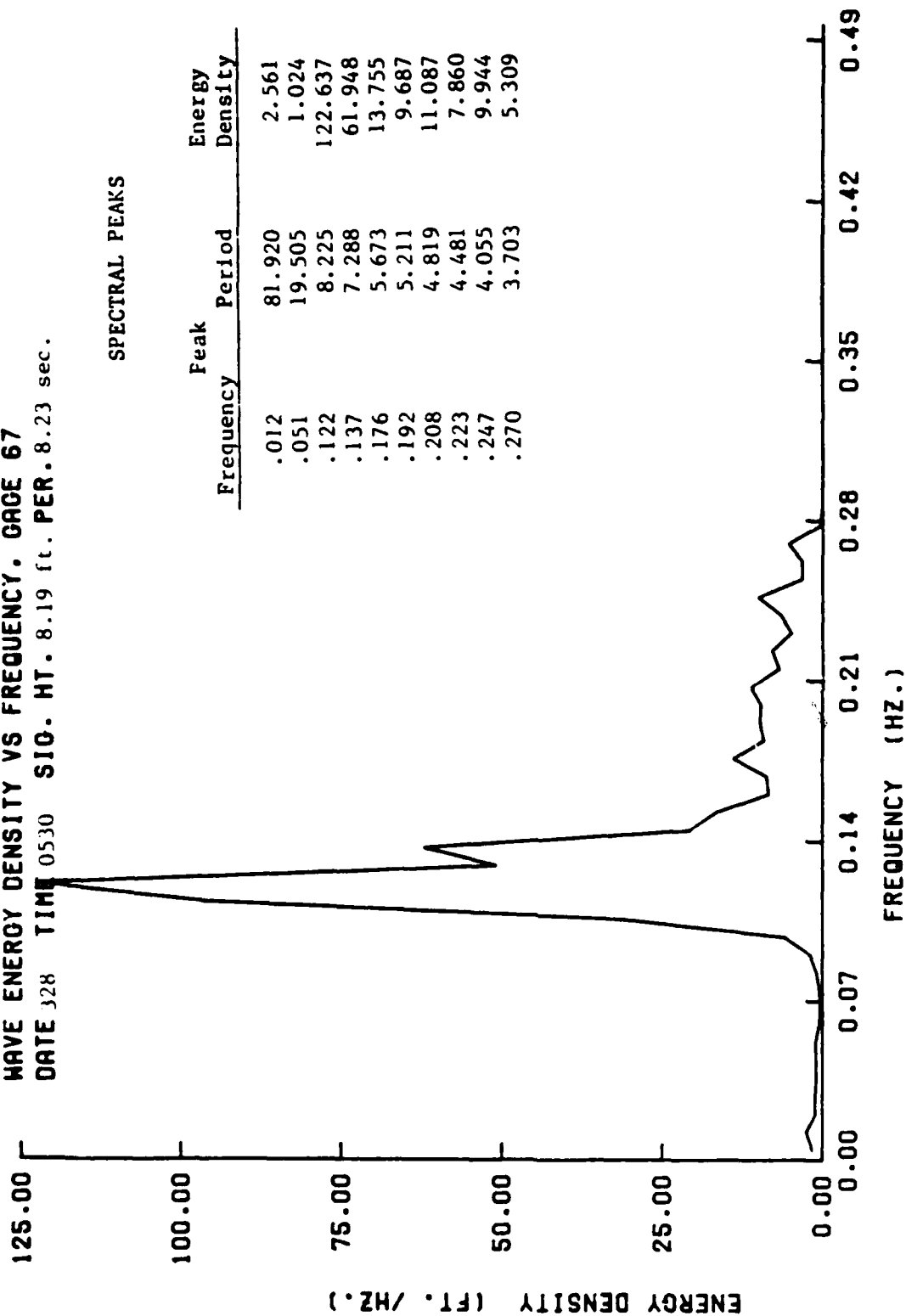
Peak Frequency	Period	Energy Density
.004	227.556	.801
.028	35.930	1.114
.043	23.011	.960
.083	12.118	.458
.122	8.225	38.635
.168	5.936	23.957
.184	5.432	19.328
.239	4.188	8.091
.262	3.814	4.177



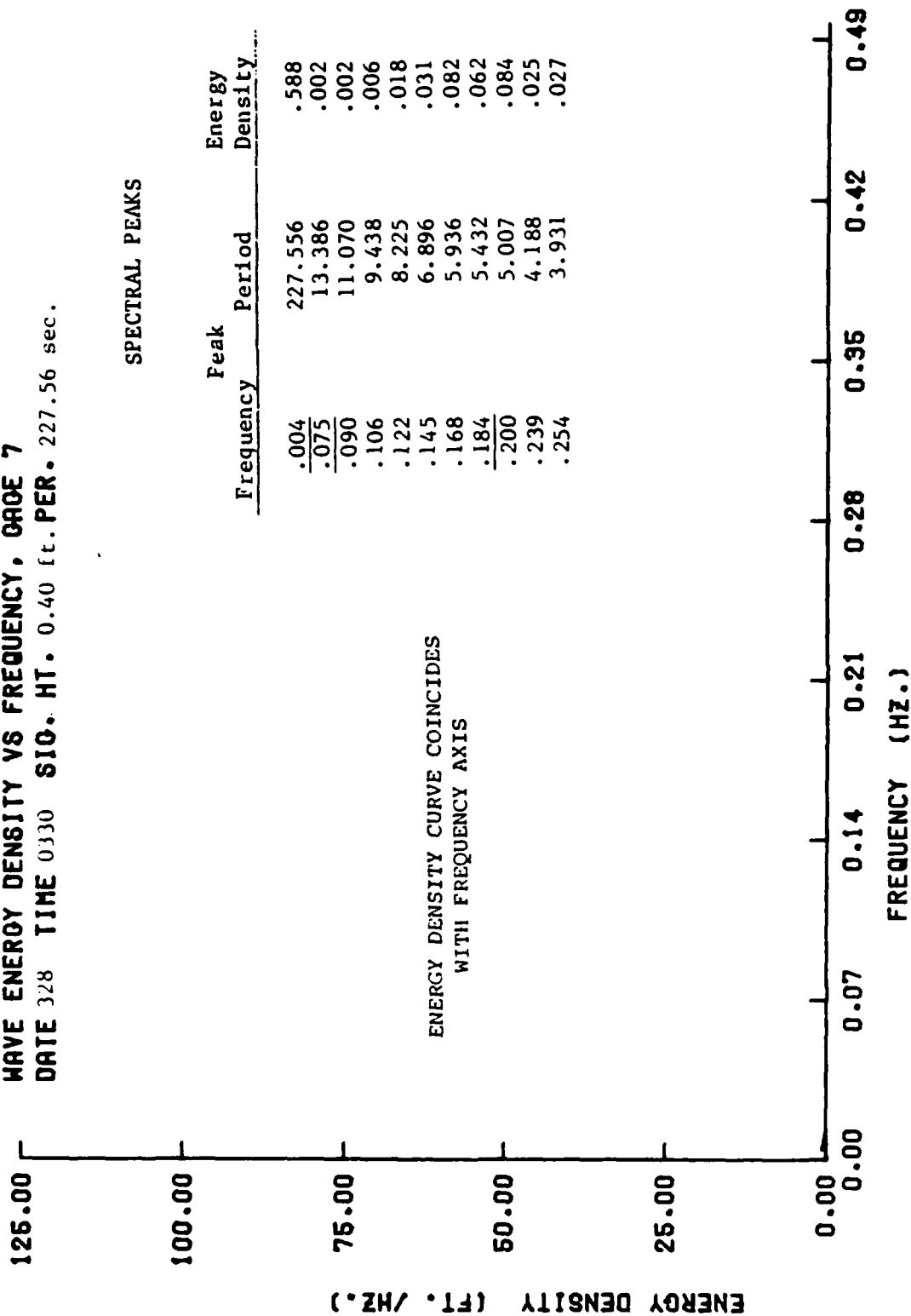
LUDINGTON HARBOR, MICHIGAN  
 HAVE ENERGY DENSITY VS FREQUENCY, GAGE 7  
 DATE 328 TIME 0530 SIO. HT. 0.47 ft. PER. 5.01 sec.



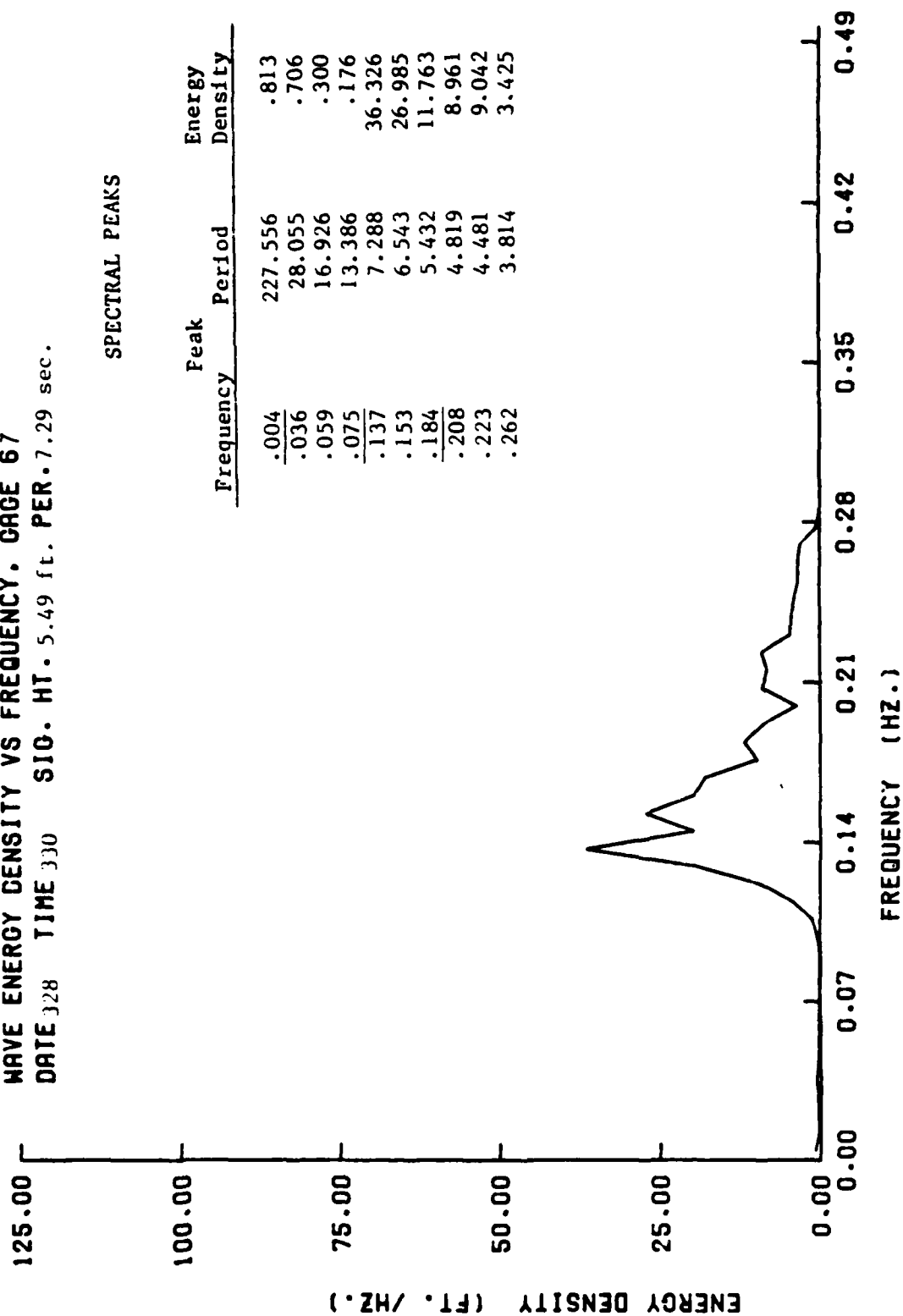
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
 DATE 328 TIME 0530 SIG. HT. 8.19 ft. PER. 8.23 sec.

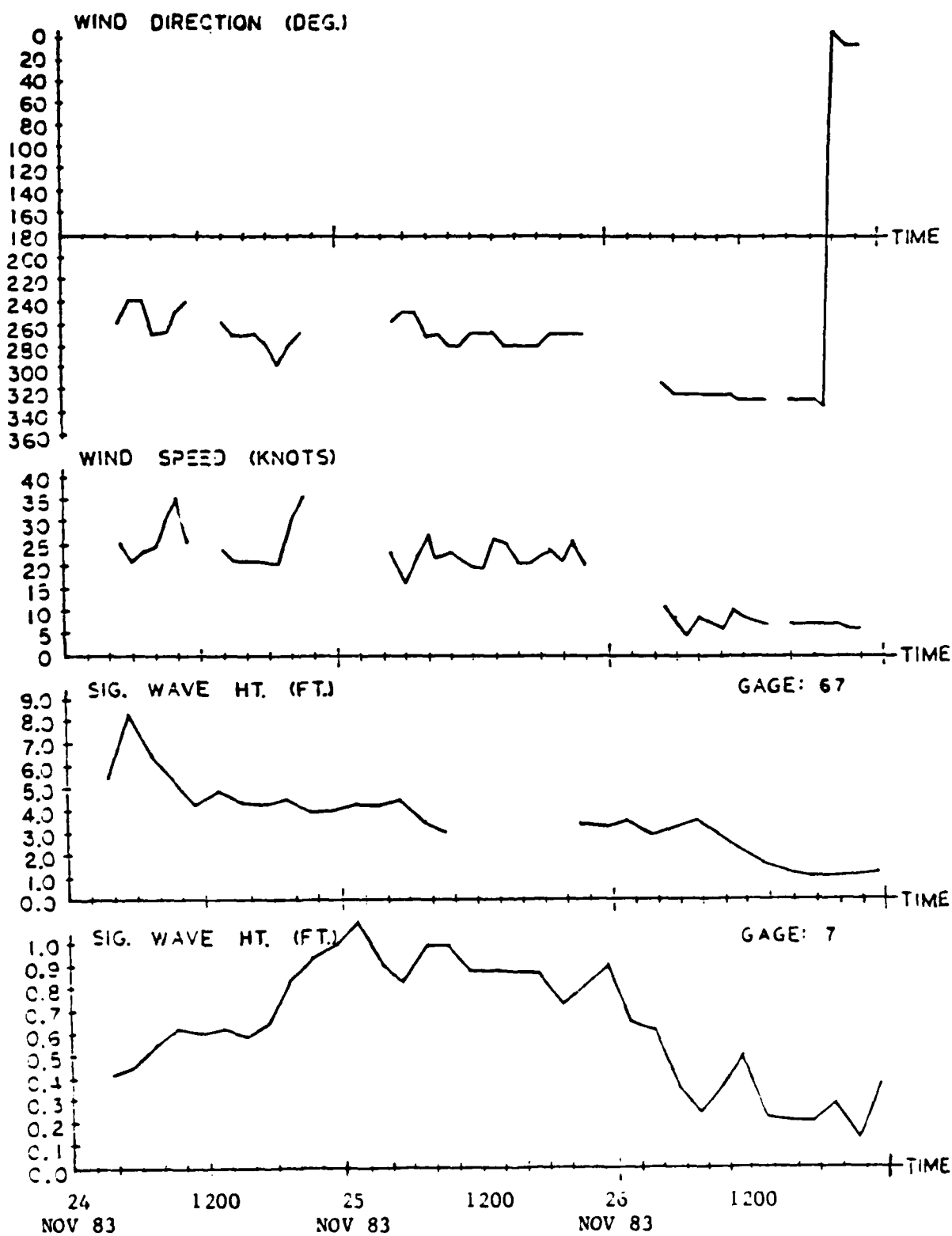


LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GRADE 7  
 DATE 328 TIME 0330 SIO. HT. 0.40 ft. PER. 227.56 sec.

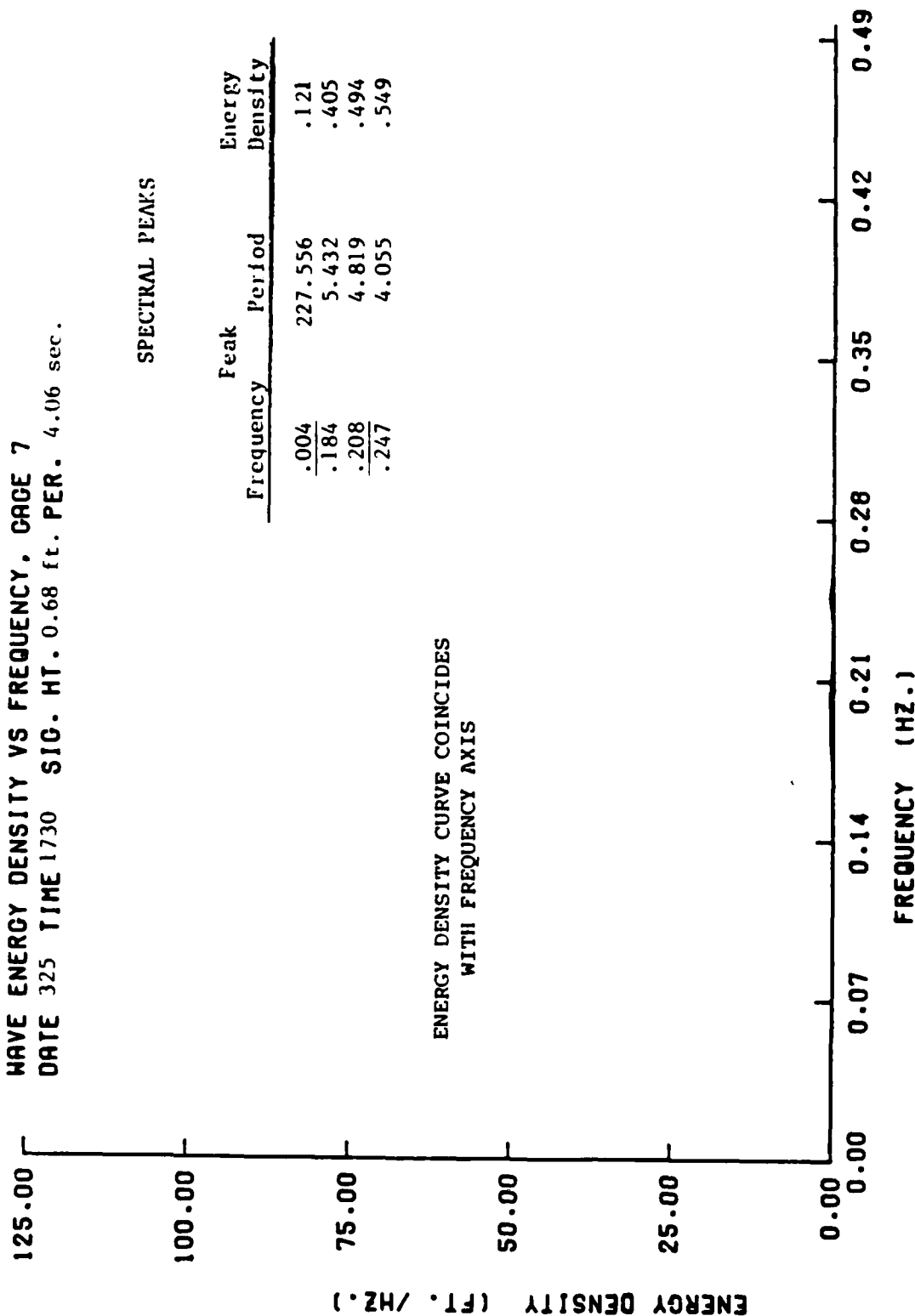


LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY. GAGE 67  
 DATE 328 TIME 330 SIG. HT. 5.49 ft. PER. 7.29 sec.





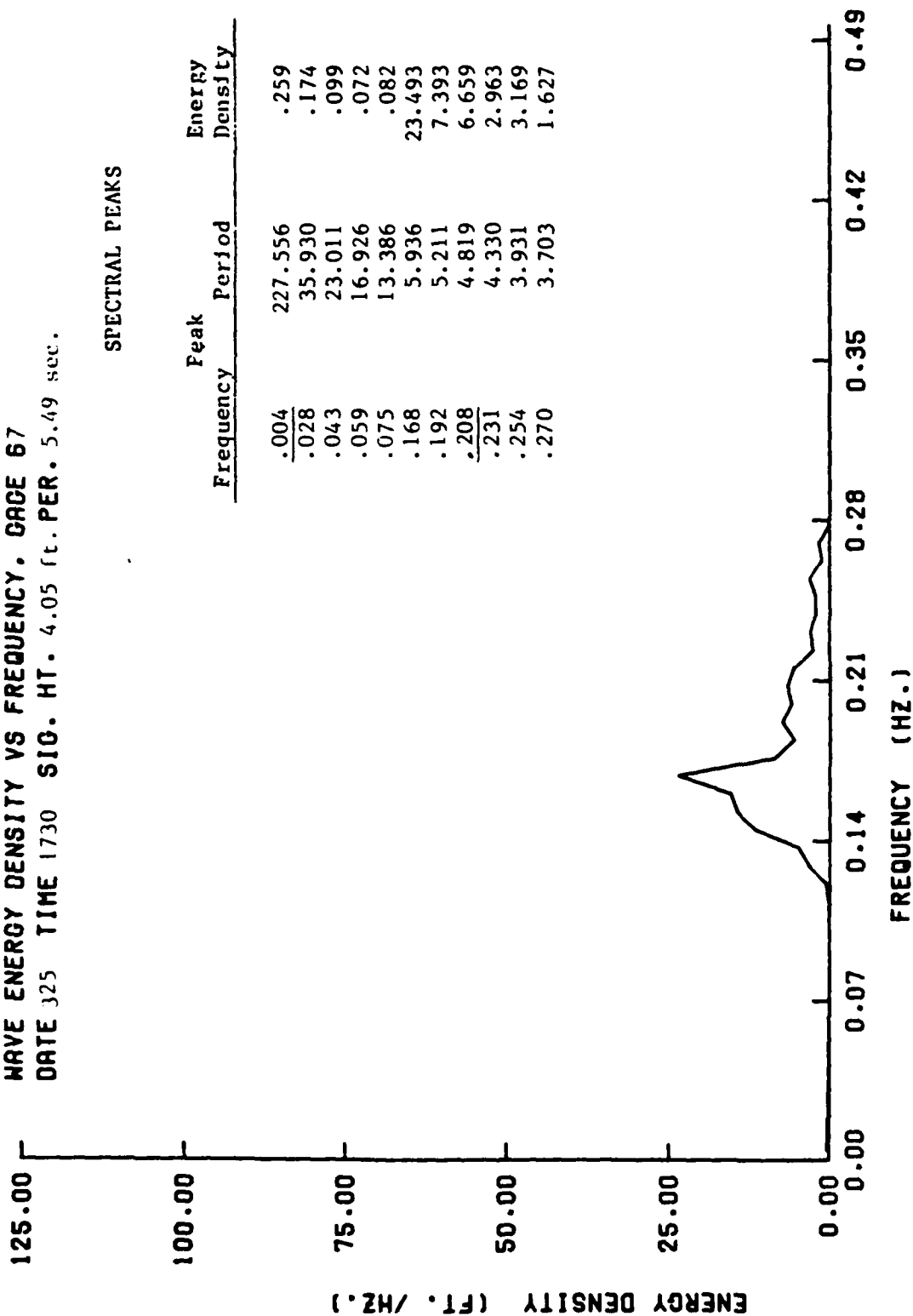
LUDINGTON HARBOR.MICHIGAN  
 HAVE ENERGY DENSITY VS FREQUENCY, CAGE 7  
 DATE 325 TIME 1730 SIG. HT. 0.68 ft. PER. 4.06 sec.



# LUDINGTON HARBOR, MICHIGAN

WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67

DATE 325 TIME 1730 SIO. HT. 4.05 ft. PER. 5.49 sec.



## SPECTRAL PEAKS

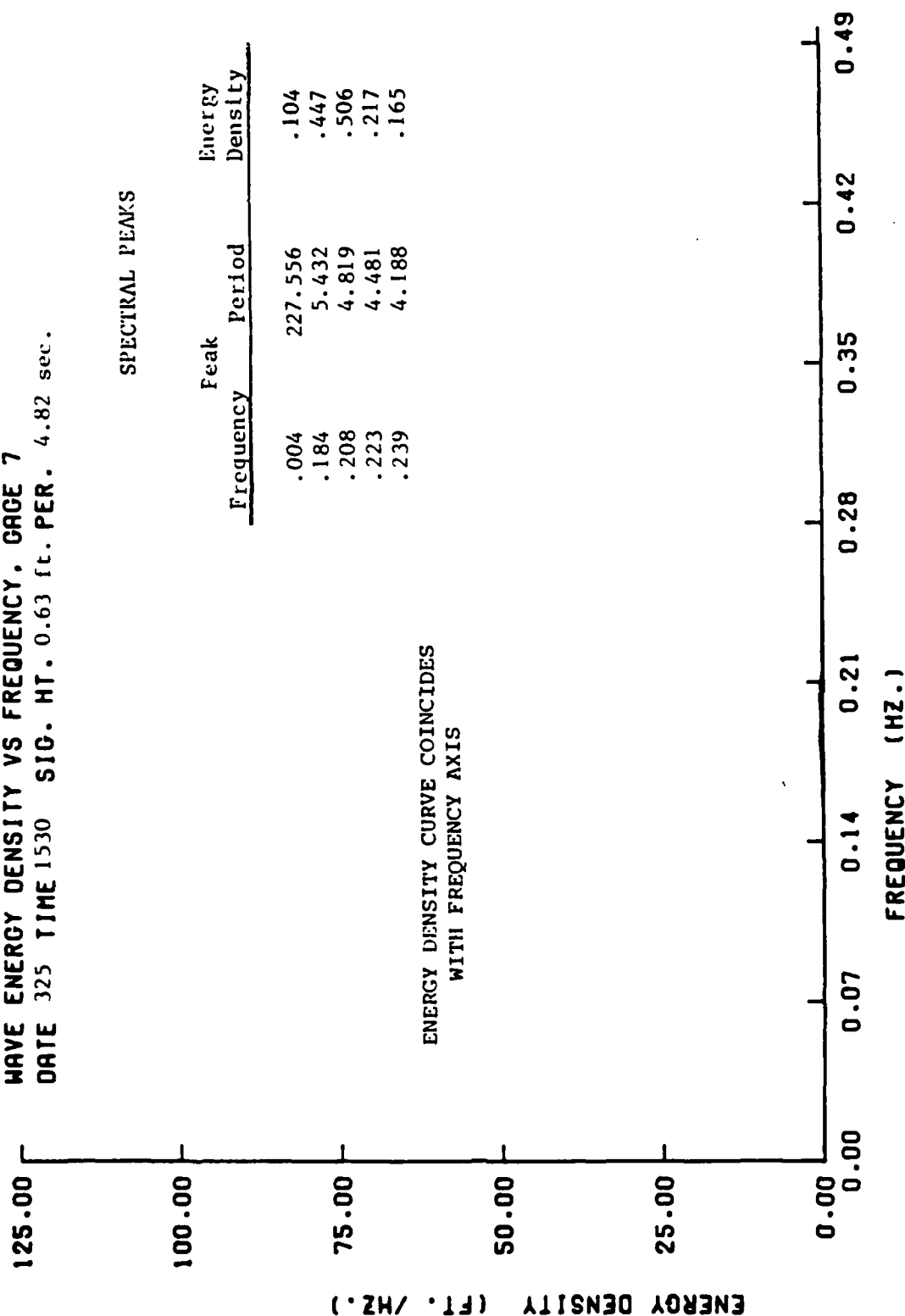
Frequency	Peak Period	Energy Density
.004	227.556	.259
.028	35.930	.174
.043	23.011	.099
.059	16.926	.072
.075	13.386	.082
.168	5.936	23.493
.192	5.211	7.393
.208	4.819	6.659
.231	4.330	2.963
.254	3.931	3.169
.270	3.703	1.627



# LUDINGTON HARBOR, MICHIGAN

WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7

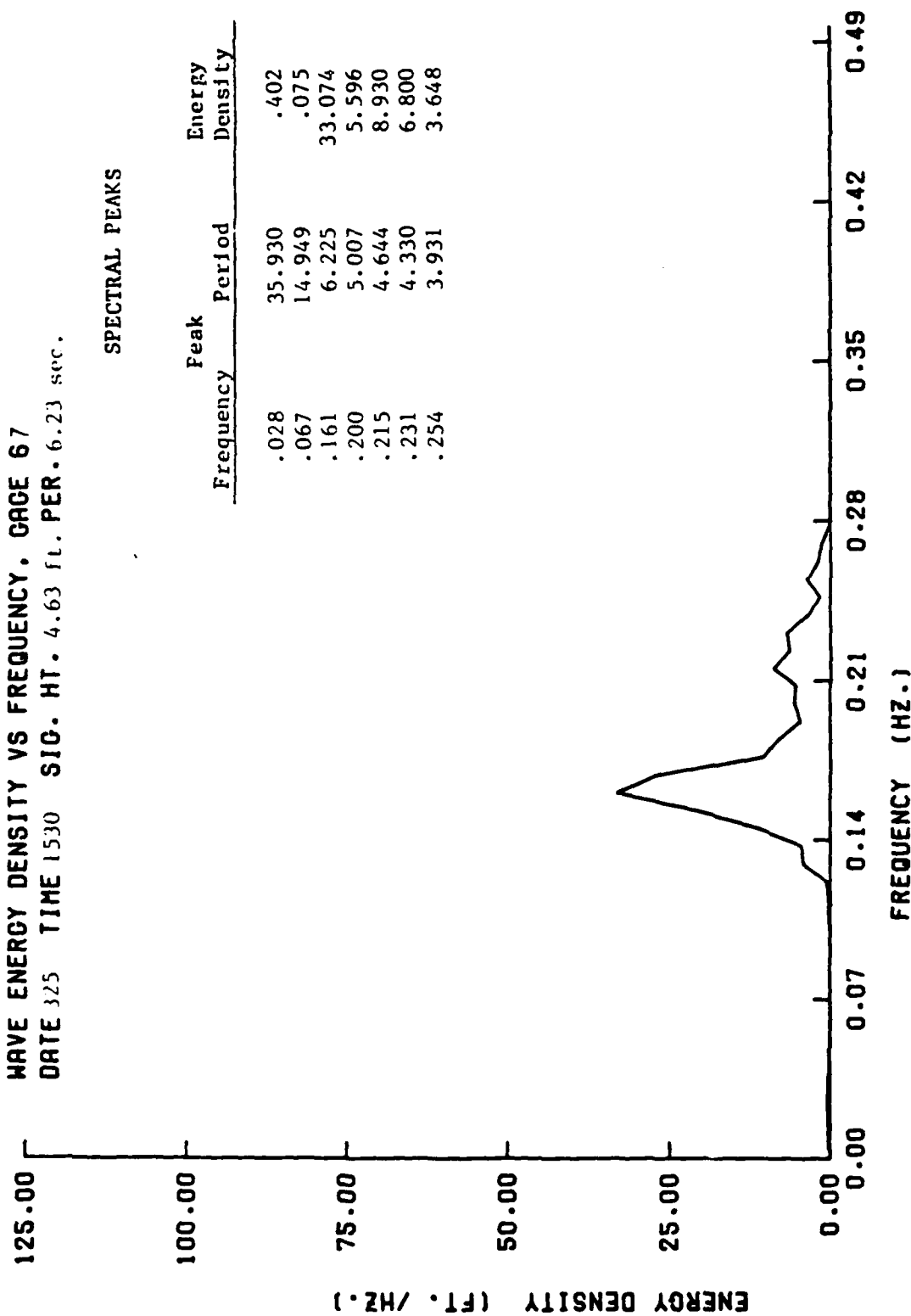
DATE 325 TIME 1530 SIG. HT. 0.63 ft. PER. 4.82 sec.



LUDINGTON HARBOR.MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY. GAGE 67  
 DATE 325 TIME 1530 SIG. HT. 4.63 ft. PER. 6.23 sec.

SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
.028	35.930	.402
.067	14.949	.075
.161	6.225	33.074
.200	5.007	5.596
.215	4.644	8.930
.231	4.330	6.800
.254	3.931	3.648



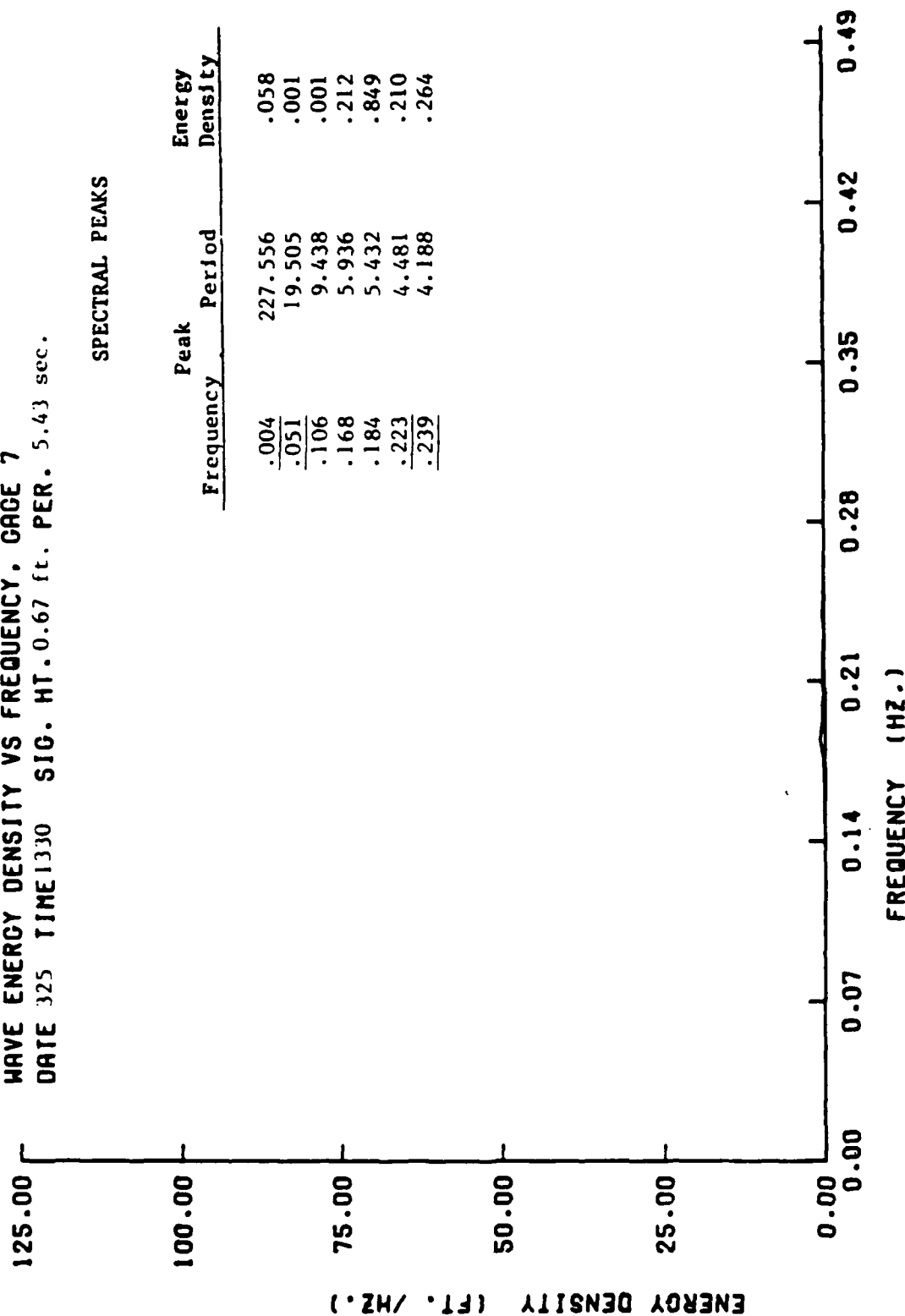
# LUDINGTON HARBOR, MICHIGAN

WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7

DATE 325 TIME 1330 SIG. HT. 0.67 ft. PER. 5.43 sec.

## SPECTRAL PEAKS

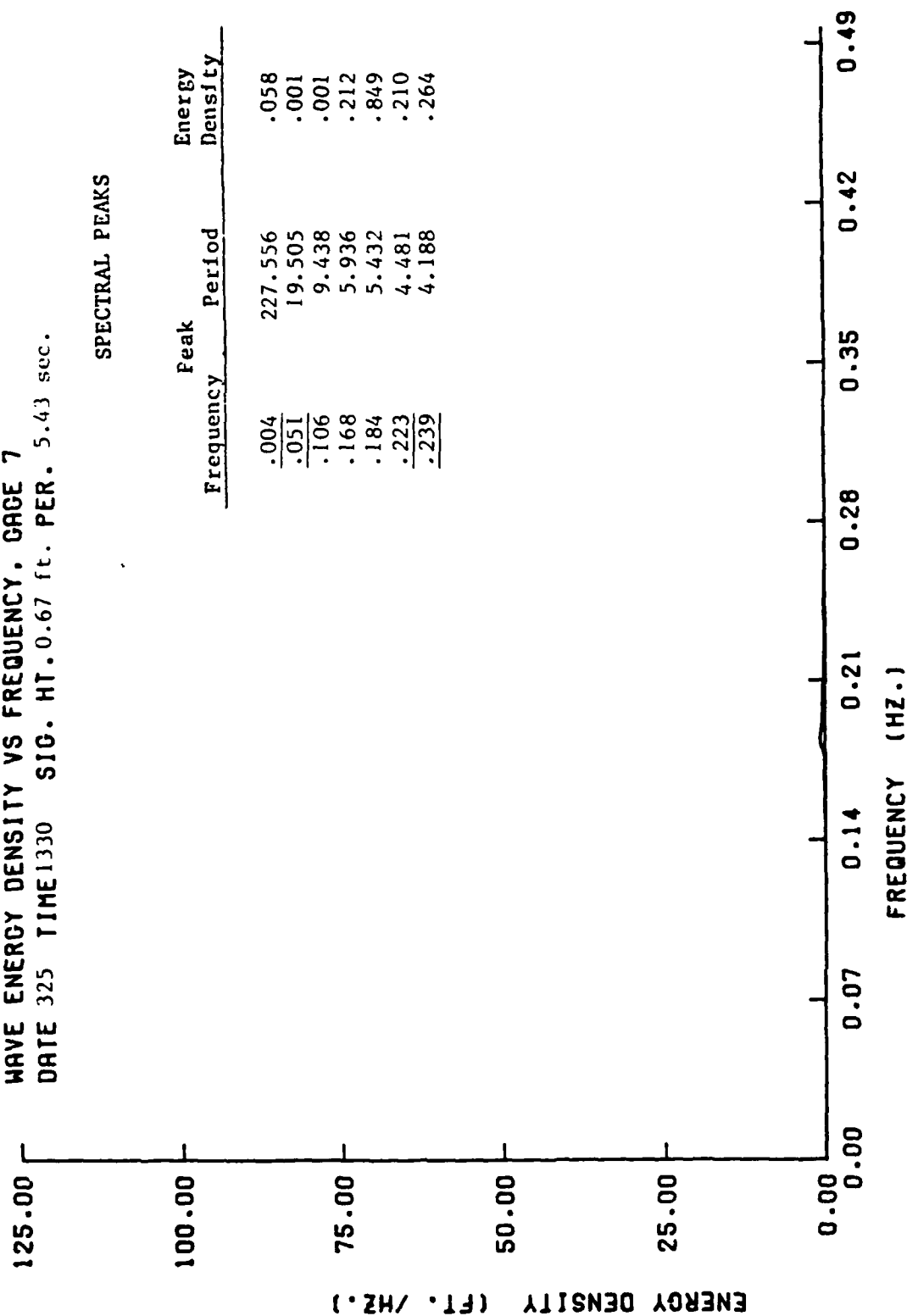
Peak		Energy Density
Frequency	Period	
.004	227.556	.058
<u>.051</u>	19.505	.001
.106	9.438	.001
.168	5.936	.212
.184	5.432	.849
<u>.223</u>	4.481	.210
<u>.239</u>	4.188	.264



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7  
 DATE 325 TIME 1330 SIG. HT. 0.67 ft. PER. 5.43 sec.

# SPECTRAL PEAKS

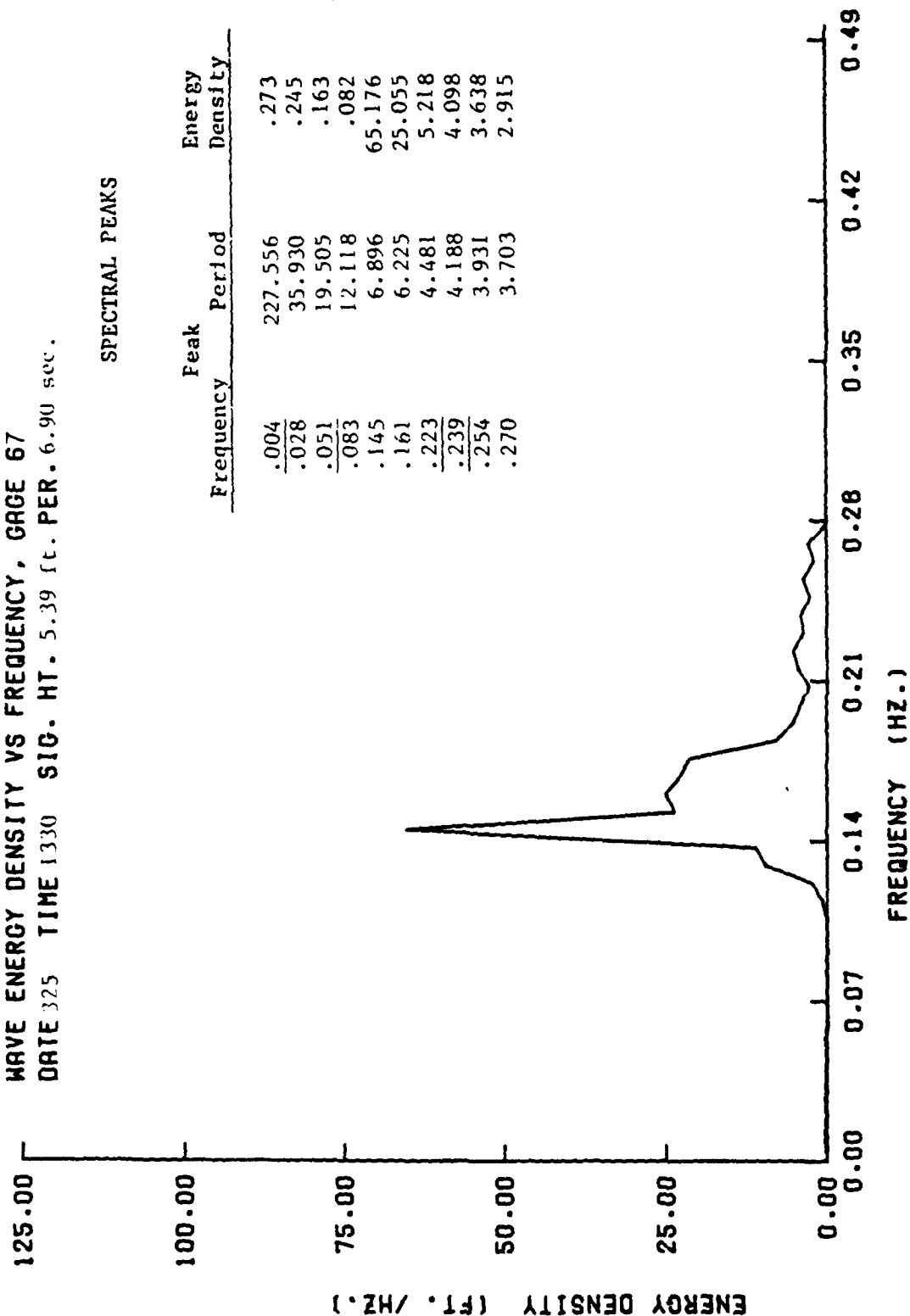
Peak		Period	Energy Density
Frequency			
.004		227.556	.058
<u>.051</u>		19.505	.001
<u>.106</u>		9.438	.001
.168		5.936	.212
.184		5.432	.849
.223		4.481	.210
<u>.239</u>		4.188	.264



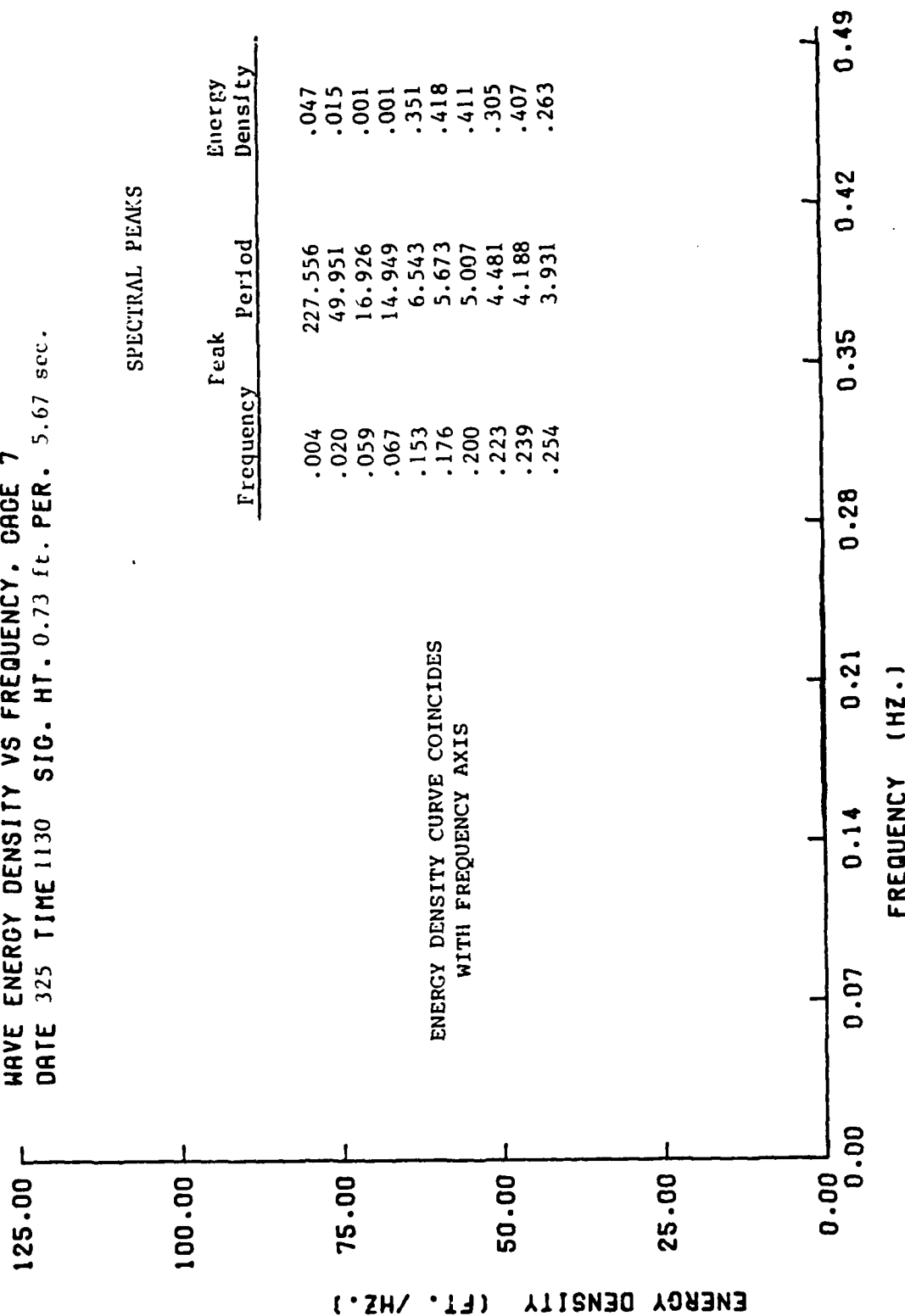
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
 DATE 325 TIME 1330 SIG. HT. 5.39 ft. PER. 6.90 sec.

SPECTRAL PEAKS

Frequency	Peak Period	Energy Density
.004	227.556	.273
.028	35.930	.245
.051	19.505	.163
.083	12.118	.082
.145	6.896	65.176
.161	6.225	25.055
.223	4.481	5.218
.239	4.188	4.098
.254	3.931	3.638
.270	3.703	2.915



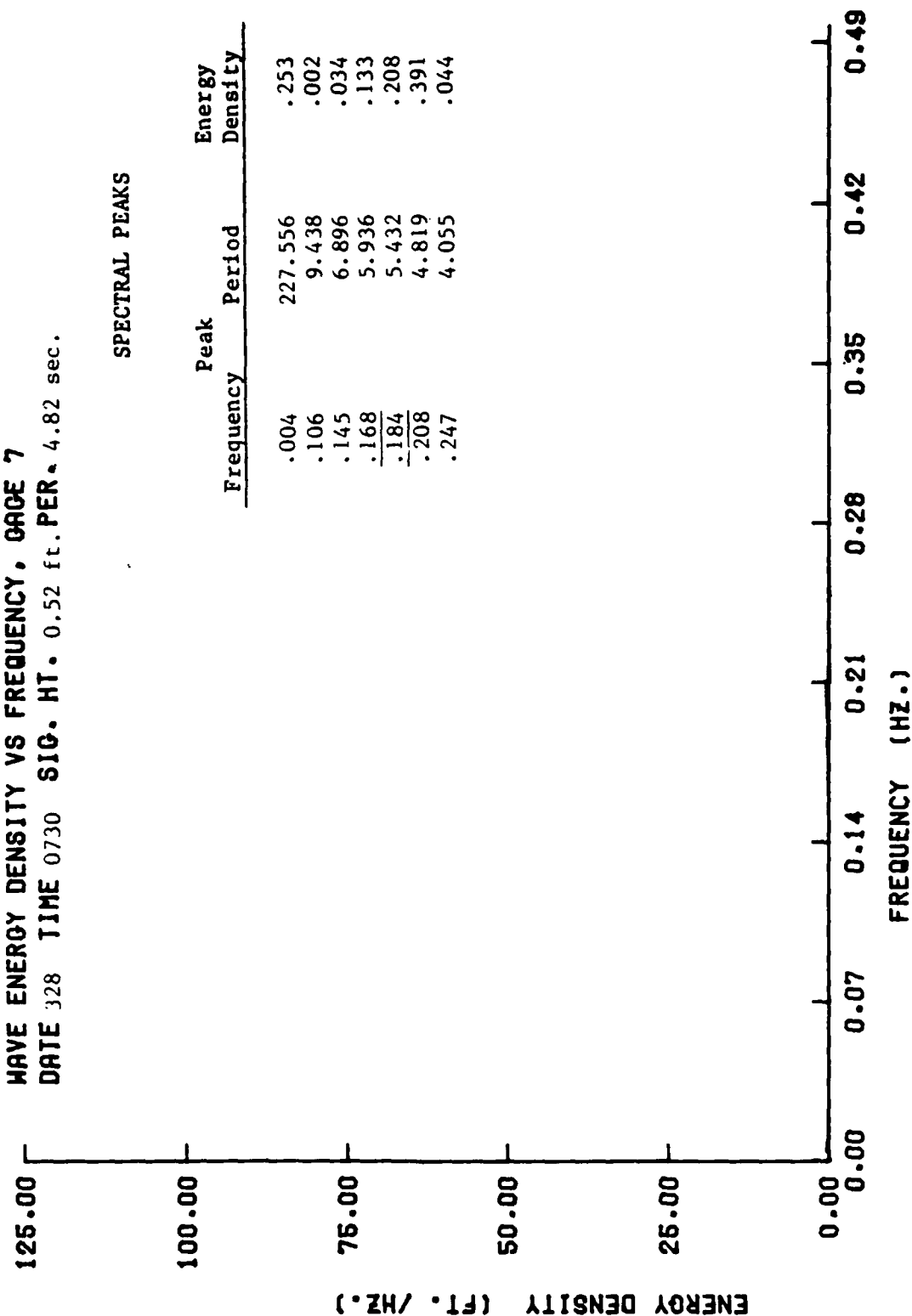
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7  
 DATE 325 TIME 1130 SIG. HT. 0.73 ft. PER. 5.67 sec.



# SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
.004	227.556	.047
.020	49.951	.015
.059	16.926	.001
.067	14.949	.001
.153	6.543	.351
.176	5.673	.418
.200	5.007	.411
.223	4.481	.305
.239	4.188	.407
.254	3.931	.263

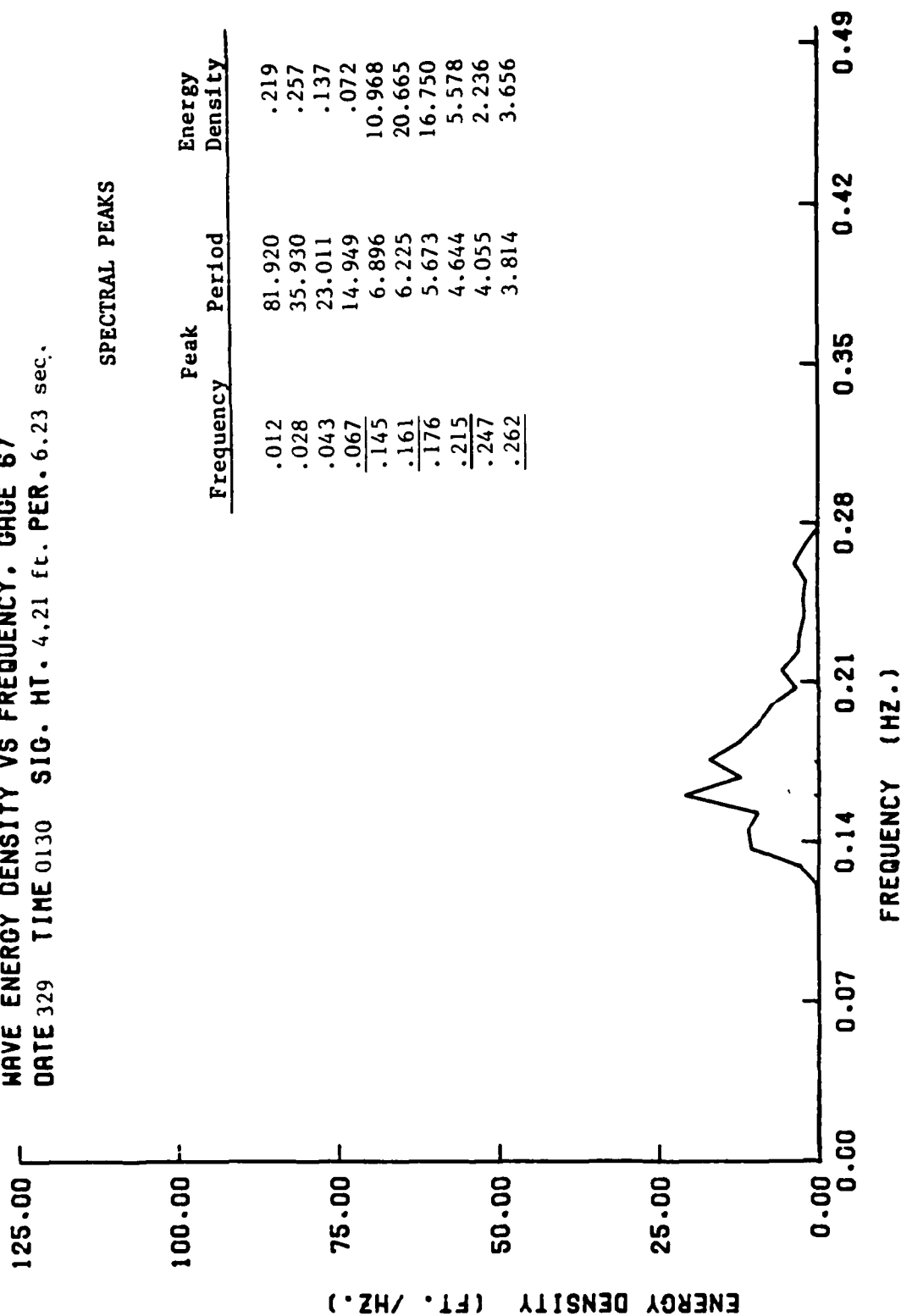
LUDINGTON HARBOR, MICHIGAN  
 HAVE ENERGY DENSITY VS FREQUENCY, PAGE 7  
 DATE 328 TIME 0730 SIG. HT. 0.52 ft. PER. 4.82 sec.



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
 DATE 329 TIME 0130 SIG. HT. 4.21 ft. PER. 6.23 sec.

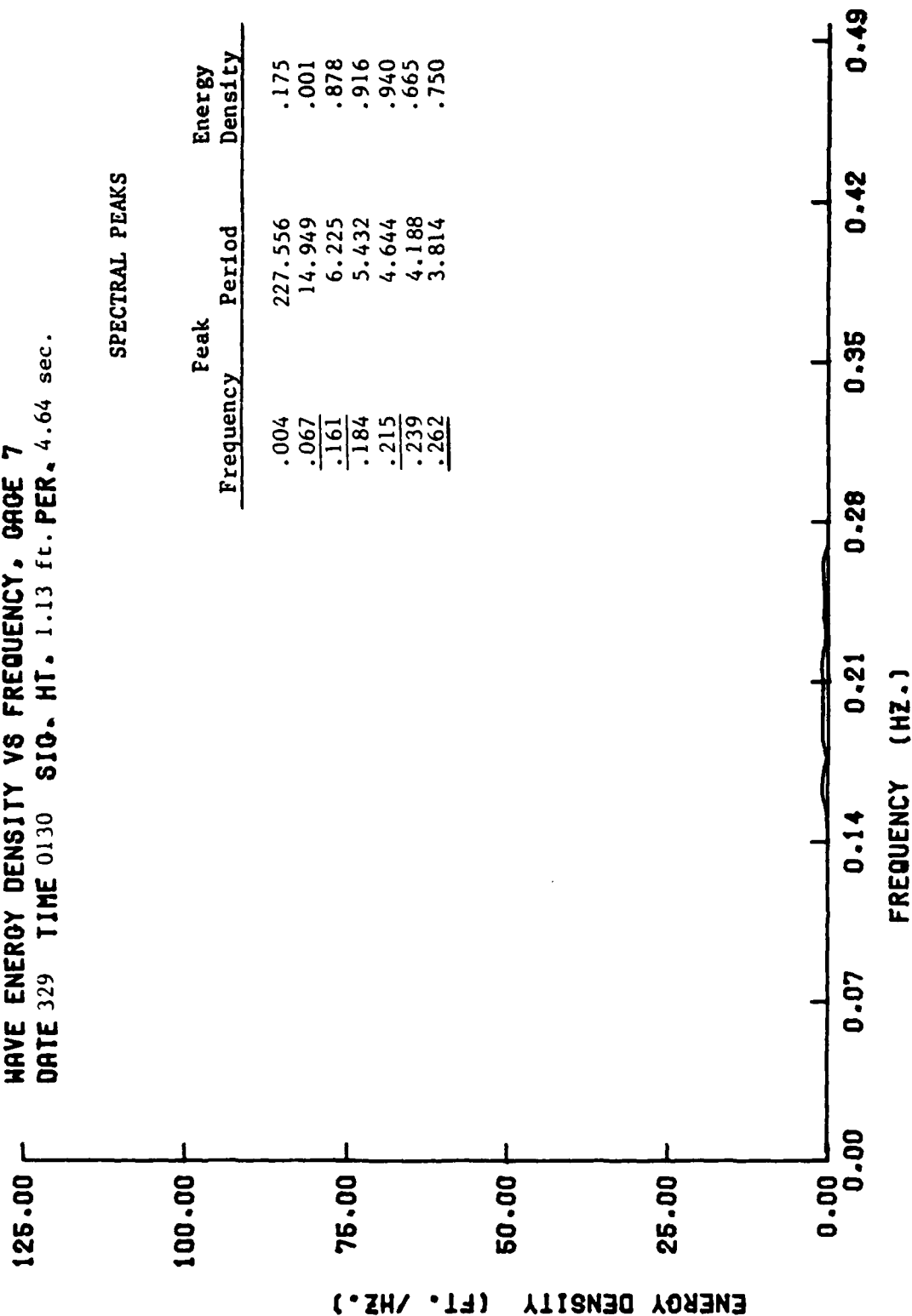
SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
.012	81.920	.219
.028	35.930	.257
.043	23.011	.137
.067	14.949	.072
.145	6.896	10.968
.161	6.225	20.665
.176	5.673	16.750
.215	4.644	5.578
.247	4.055	2.236
.262	3.814	3.656

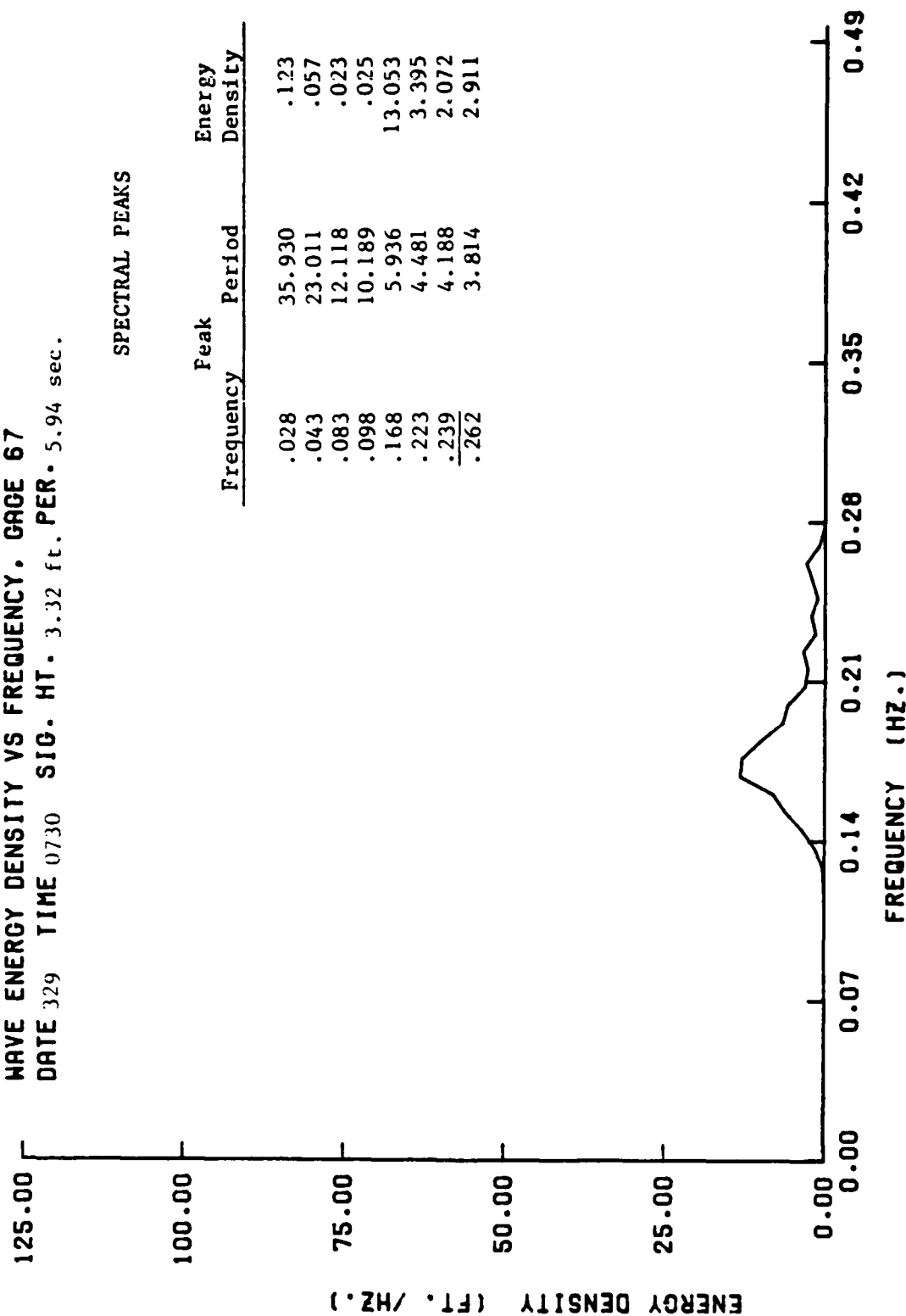




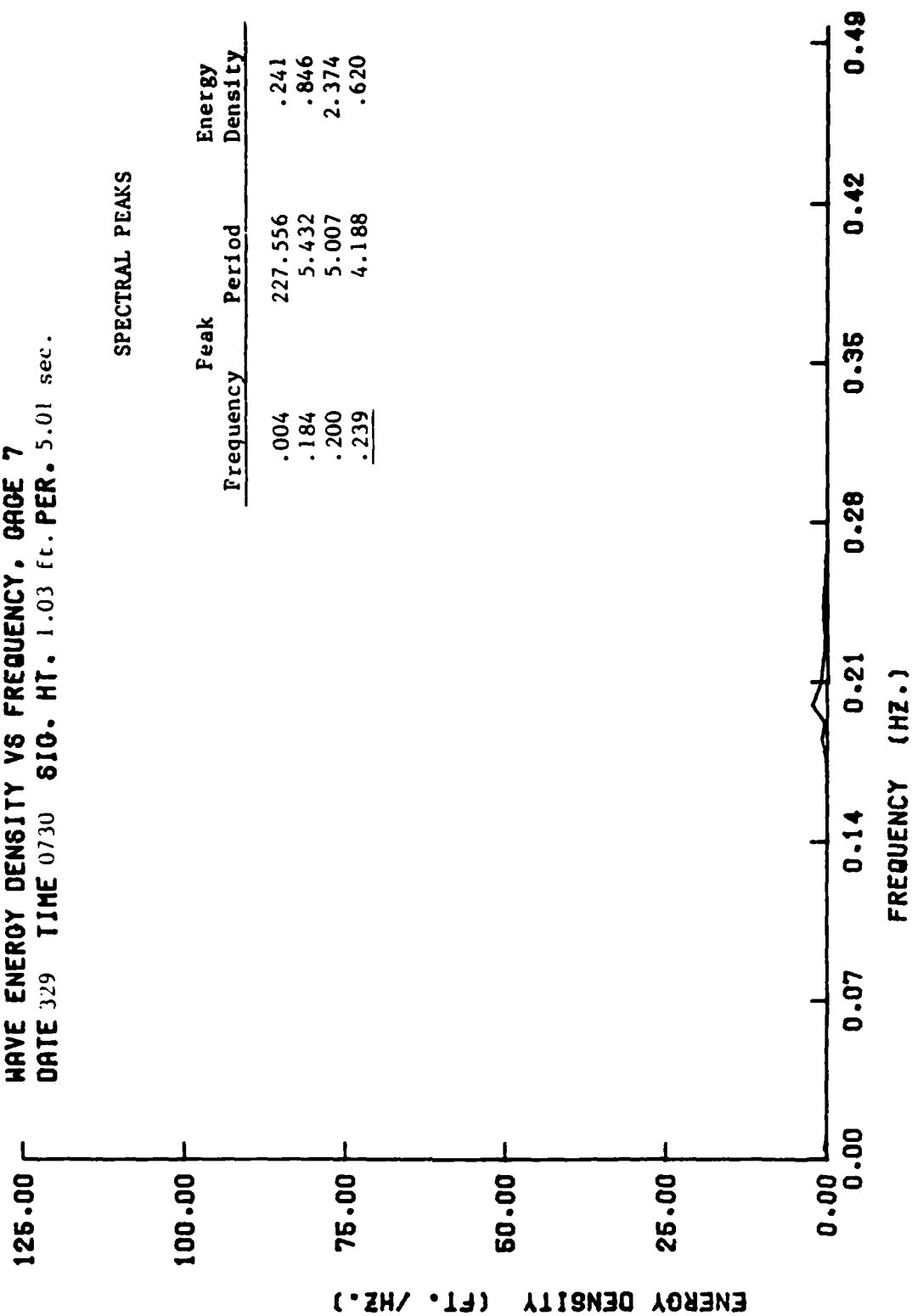
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7  
 DATE 329 TIME 0130 SIG. HT. 1.13 ft. PER. 4.64 sec.

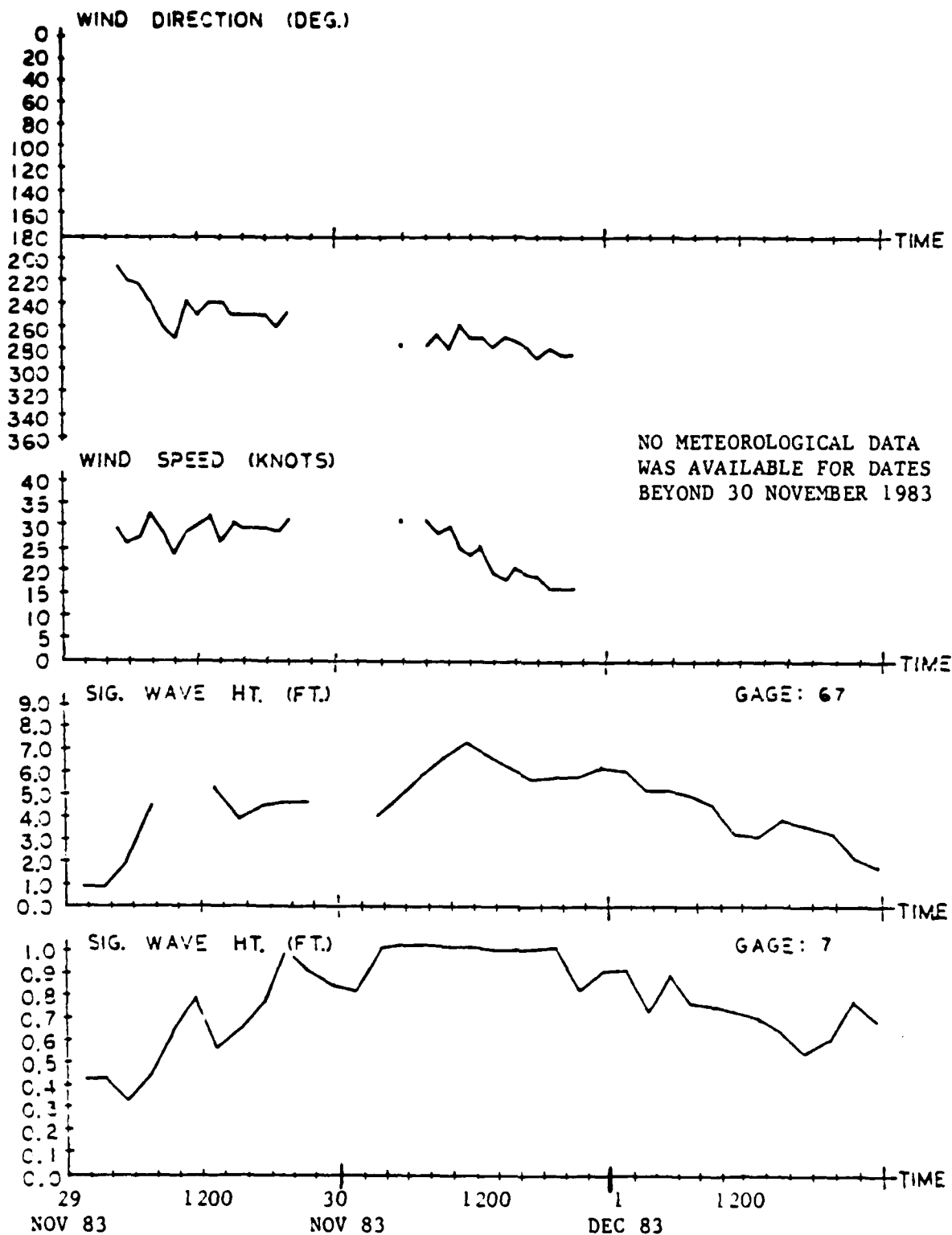


LUDINGTON HARBOR, MICHIGAN  
 HAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
 DATE 329 TIME 0730 SIG. HT. 3.32 ft. PER. 5.94 sec.



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7  
 DATE 329 TIME 0730 SIG. HT. 1.03 ft. PER. 5.01 sec.

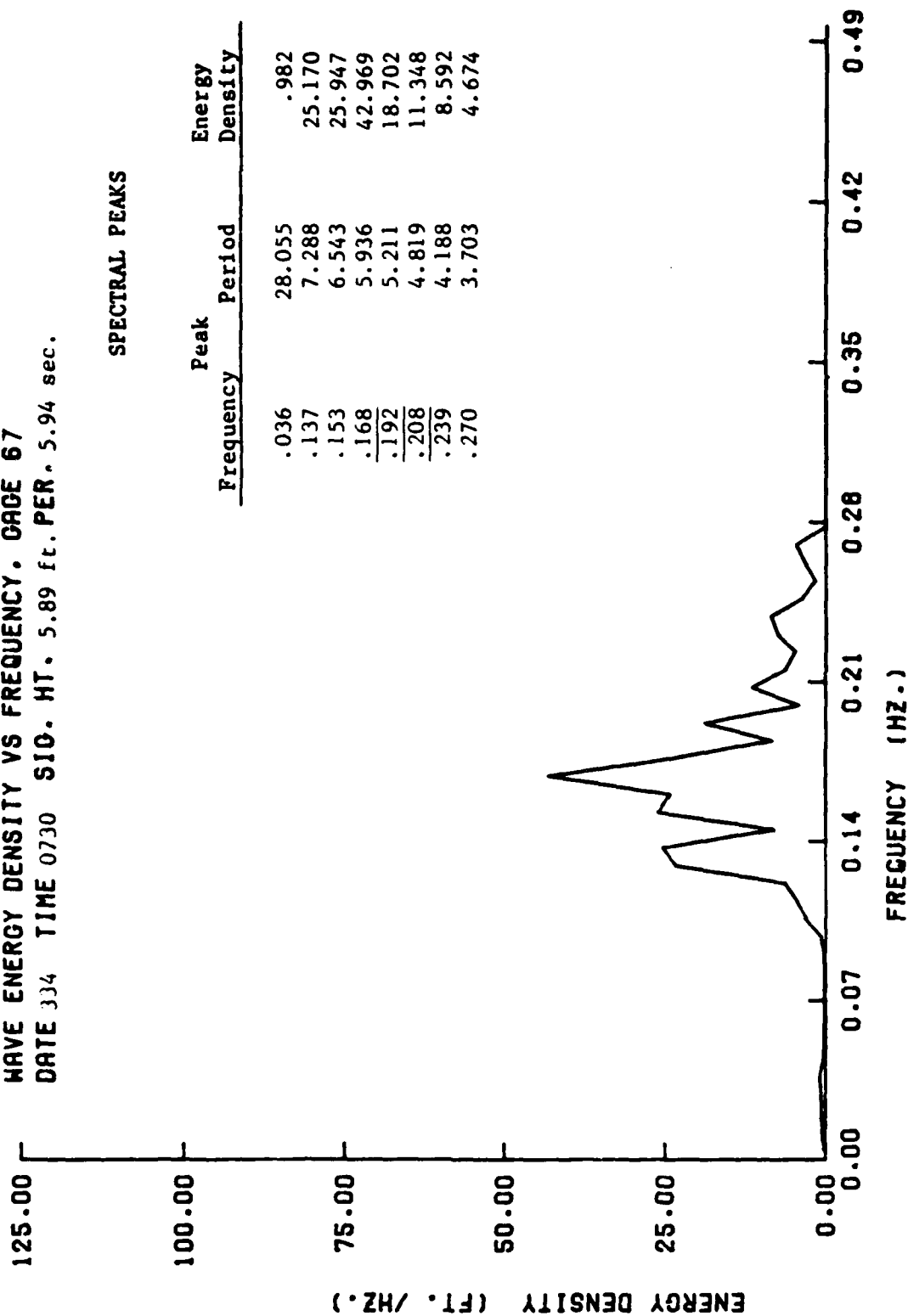




LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY. GAGE 67  
 DATE 334 TIME 0730 SIG. HT. 5.89 ft. PER. 5.94 sec.

SPECTRAL PEAKS

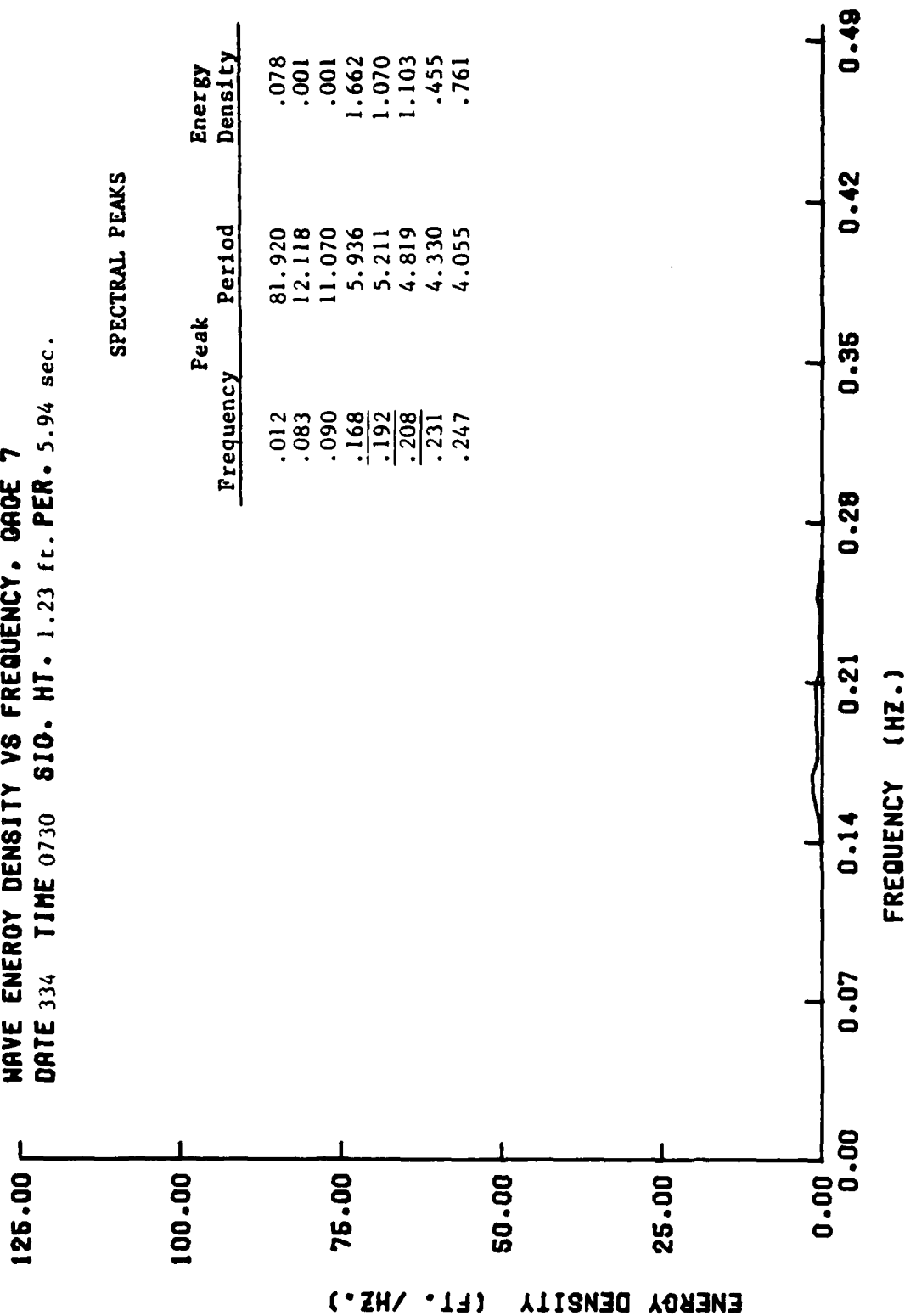
Peak		Energy Density
Frequency	Period	
.036	28.055	.982
.137	7.288	25.170
.153	6.543	25.947
.168	5.936	42.969
.192	5.211	18.702
.208	4.819	11.348
.239	4.188	8.592
.270	3.703	4.674



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, PAGE 7  
 DATE 334 TIME 0730 SIG. HT. 1.23 ft. PER. 5.94 sec.

SPECTRAL PEAKS

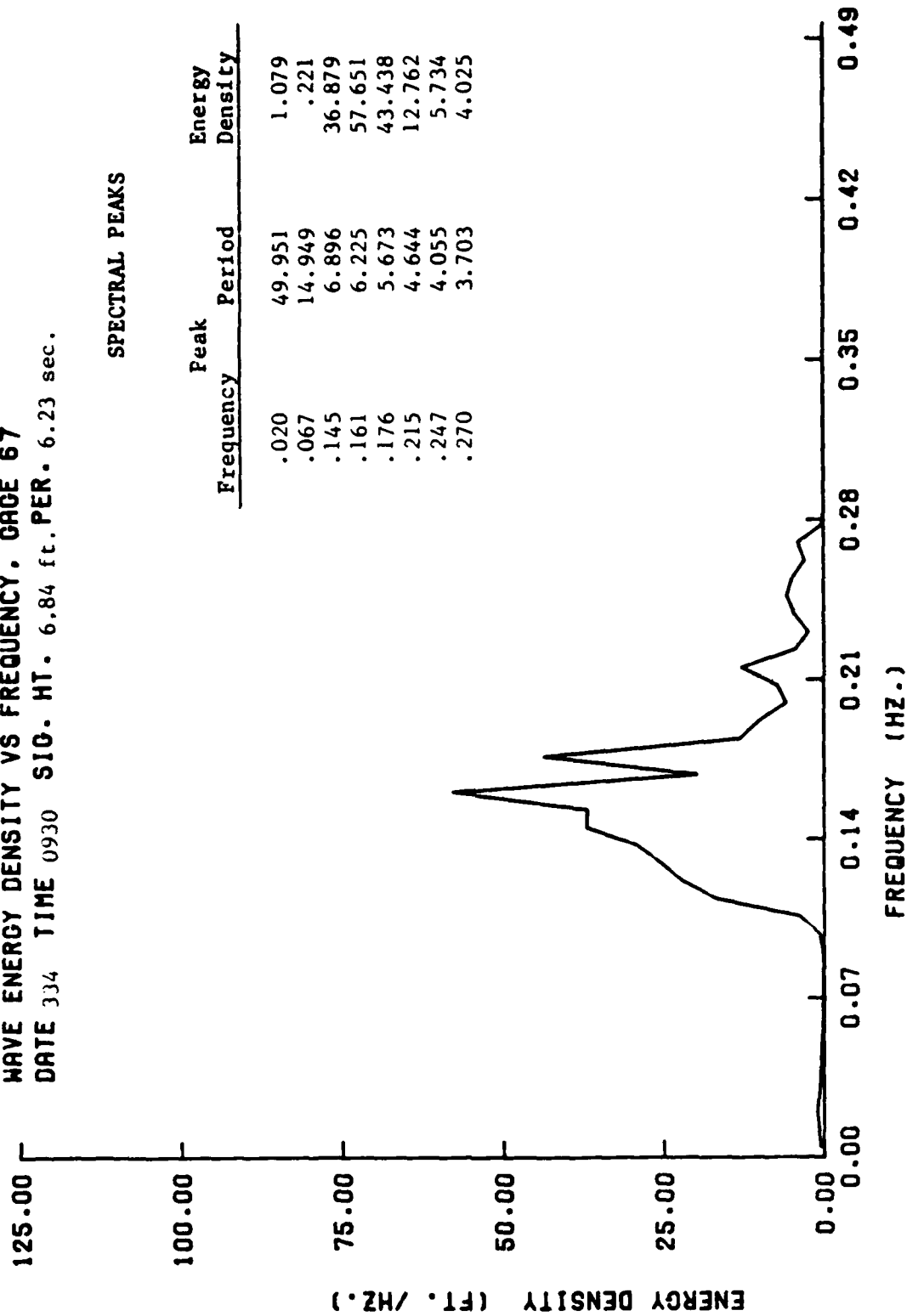
Peak		Period	Energy Density
Frequency			
.012		81.920	.078
.083		12.118	.001
.090		11.070	.001
.168		5.936	1.662
.192		5.211	1.070
.208		4.819	1.103
.231		4.330	.455
.247		4.055	.761



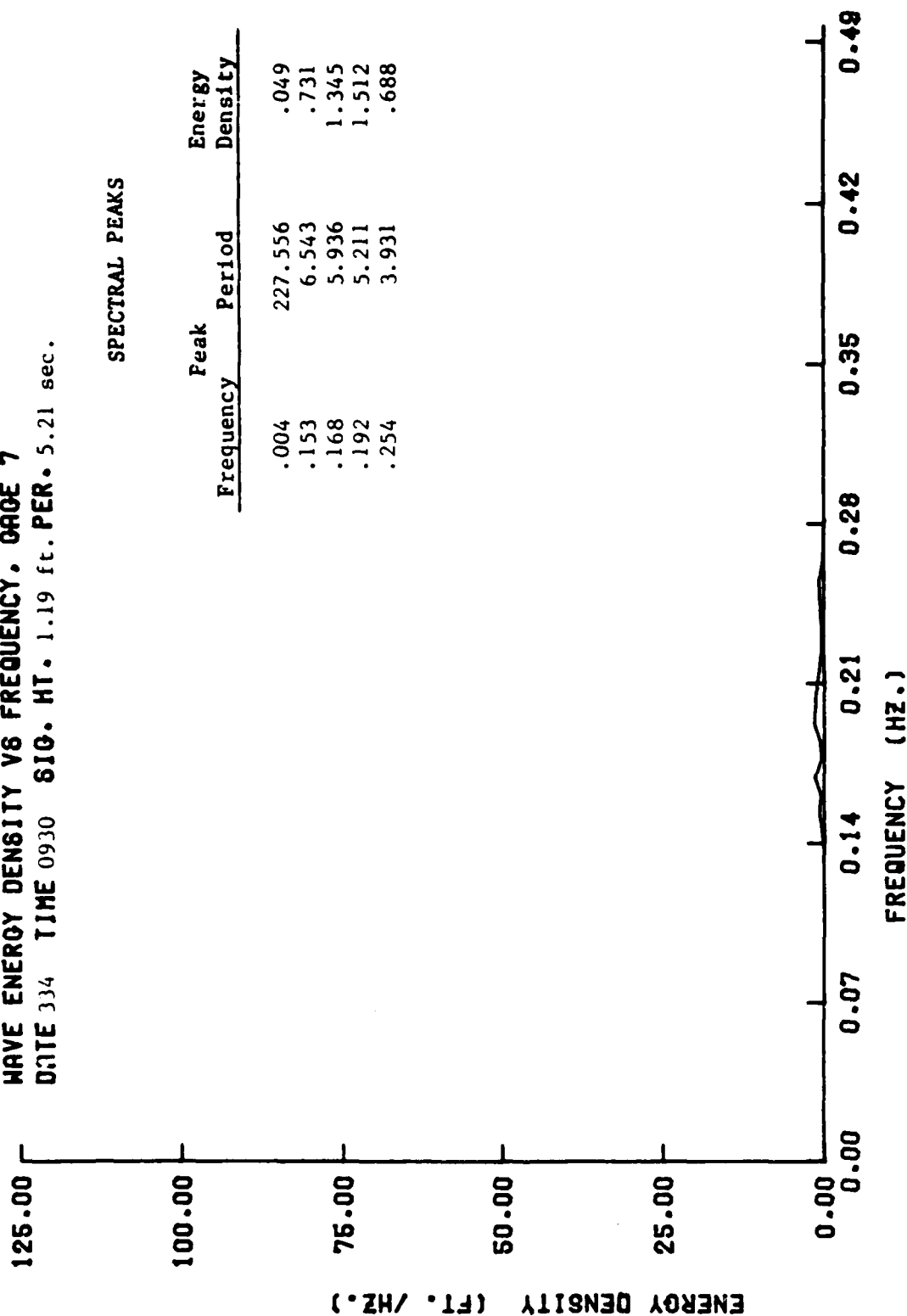
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY. GAGE 67  
 DATE 334 TIME 0930 SIG. HT. 6.84 ft. PER. 6.23 sec.

SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
.020	49.951	1.079
.067	14.949	.221
.145	6.896	36.879
.161	6.225	57.651
.176	5.673	43.438
.215	4.644	12.762
.247	4.055	5.734
.270	3.703	4.025

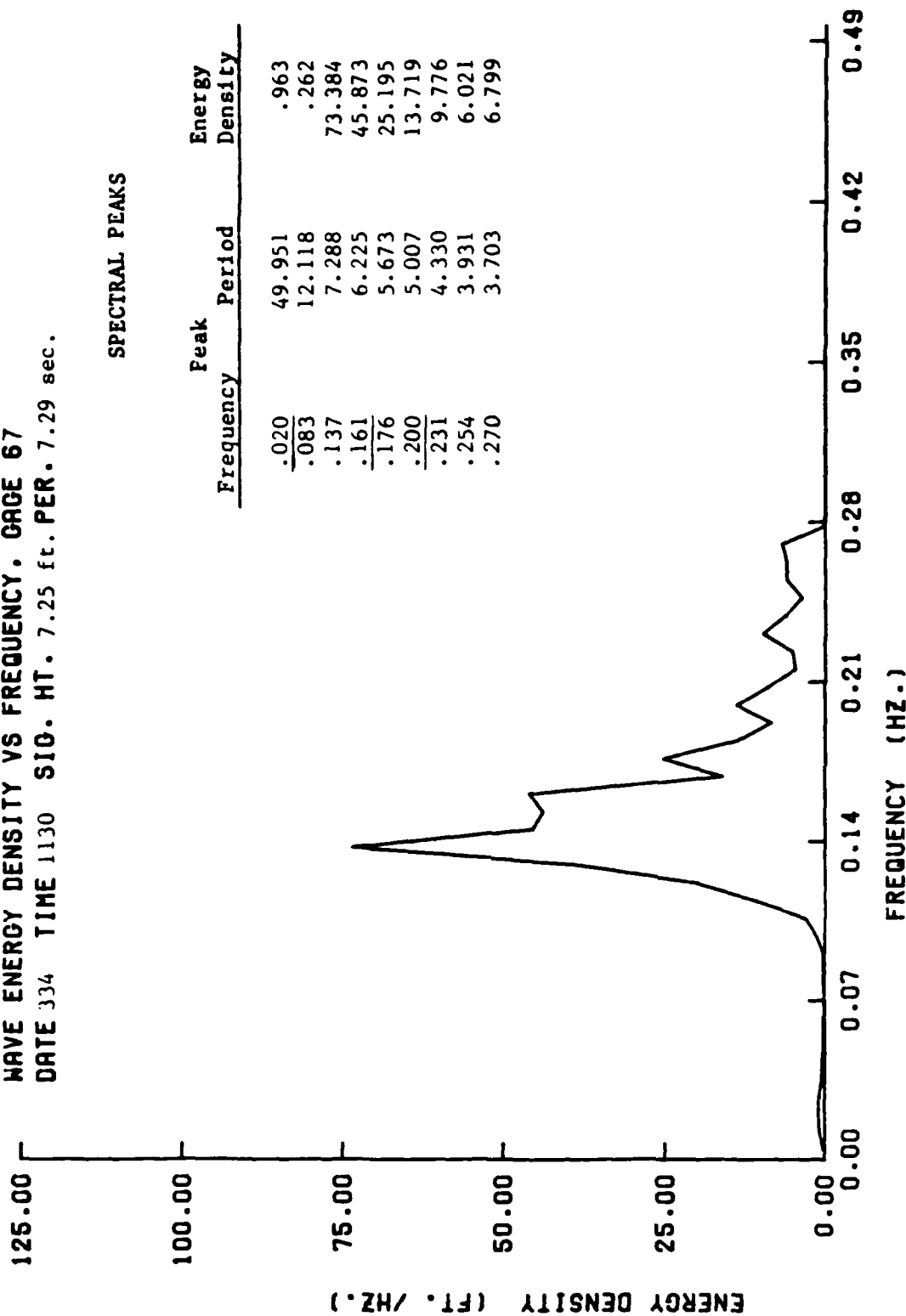


LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GRADE 7  
 DATE 334 TIME 0930 SIG. HT. 1.19 ft. PER. 5.21 sec.





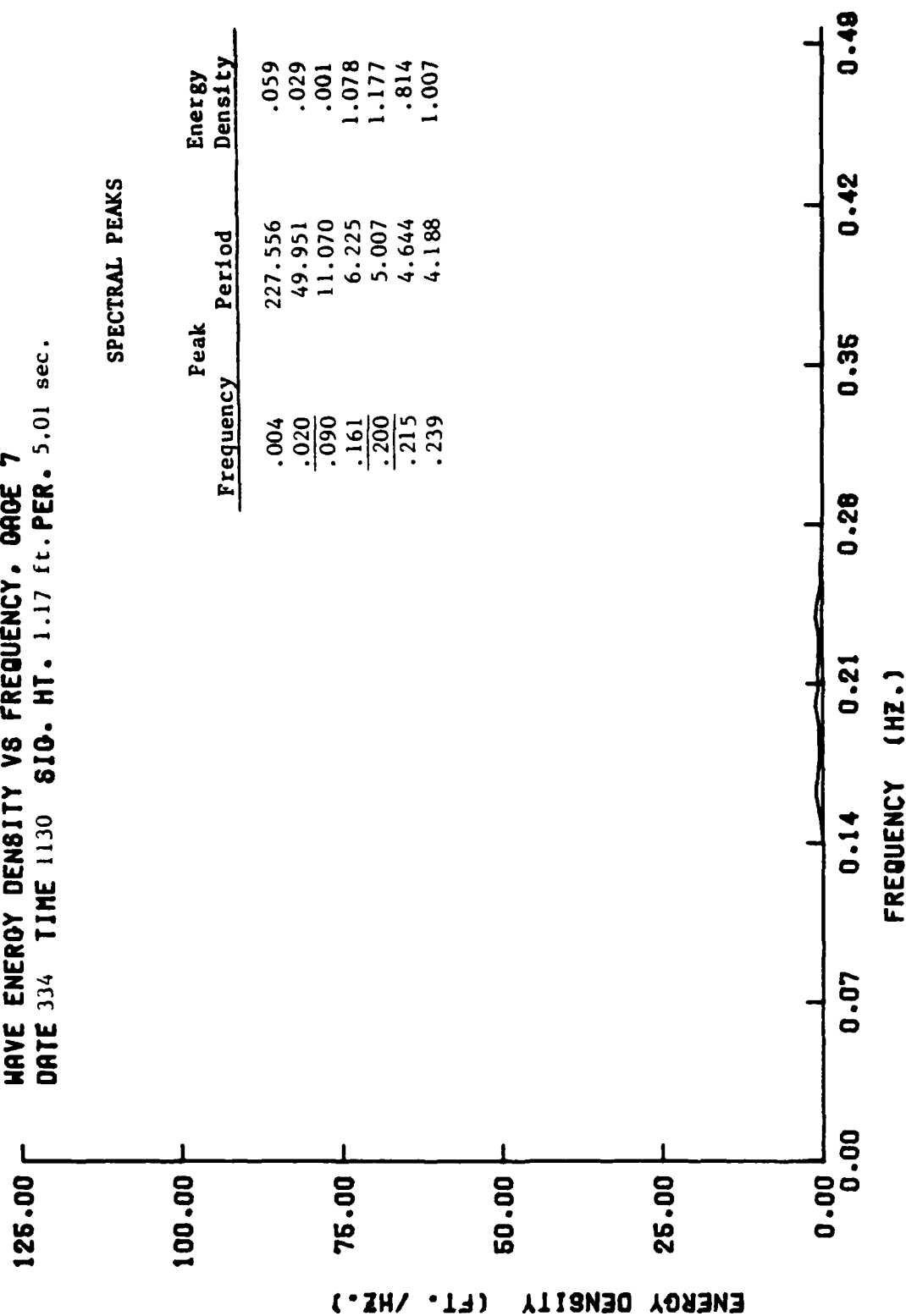
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
 DATE 334 TIME 1130 SIG. HT. 7.25 ft. PER. 7.29 sec.



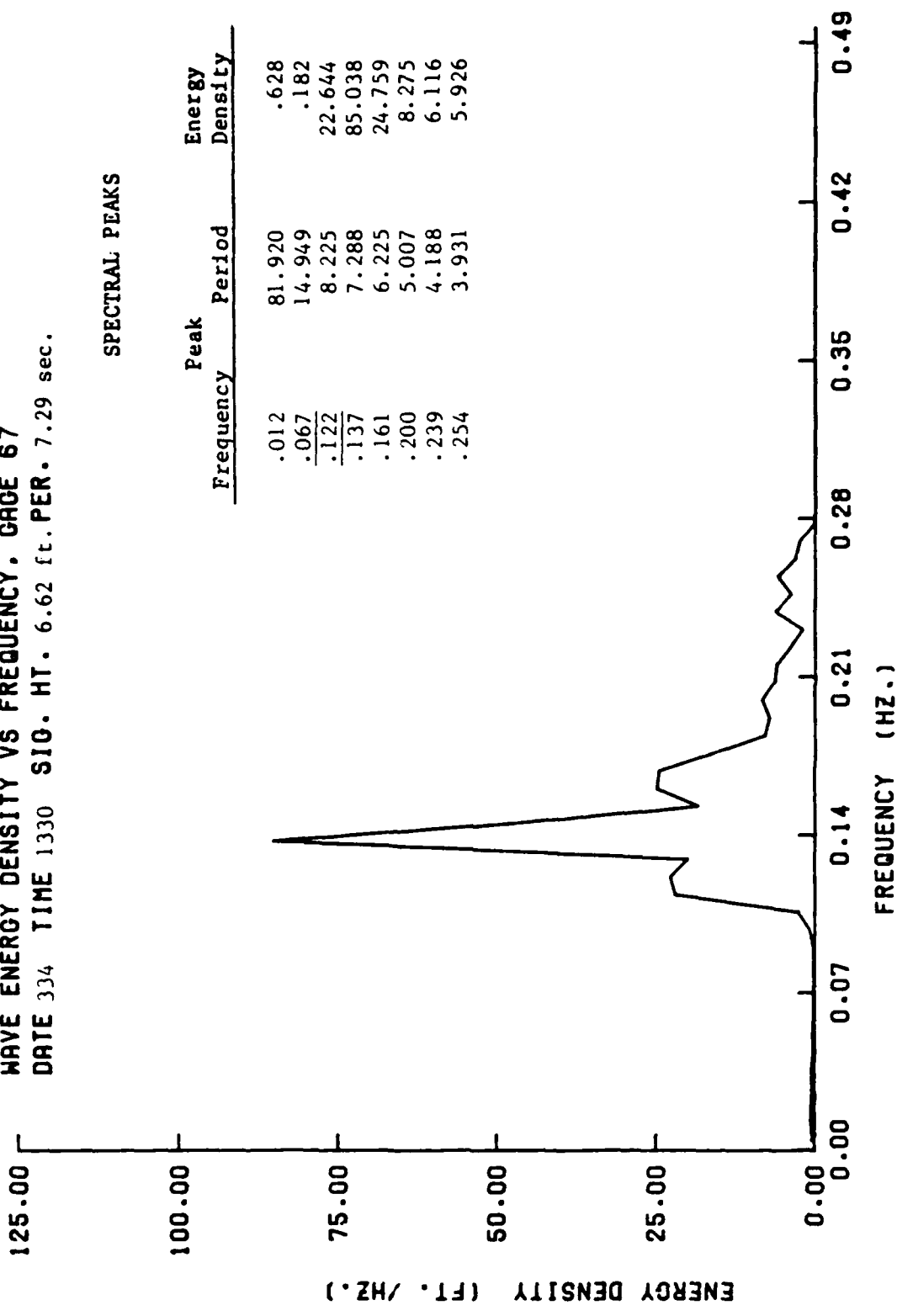
SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
.020	49.951	.963
.083	12.118	.262
.137	7.288	73.384
.161	6.225	45.873
.176	5.673	25.195
.200	5.007	13.719
.231	4.330	9.776
.254	3.931	6.021
.270	3.703	6.799

LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GRADE 7  
 DATE 334 TIME 1130 SIG. HT. 1.17 ft. PER. 5.01 sec.



LUDINGTON HARBOR, MICHIGAN  
 HAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
 DATE 334 TIME 1330 SIG. HT. 6.62 ft. PER. 7.29 sec.



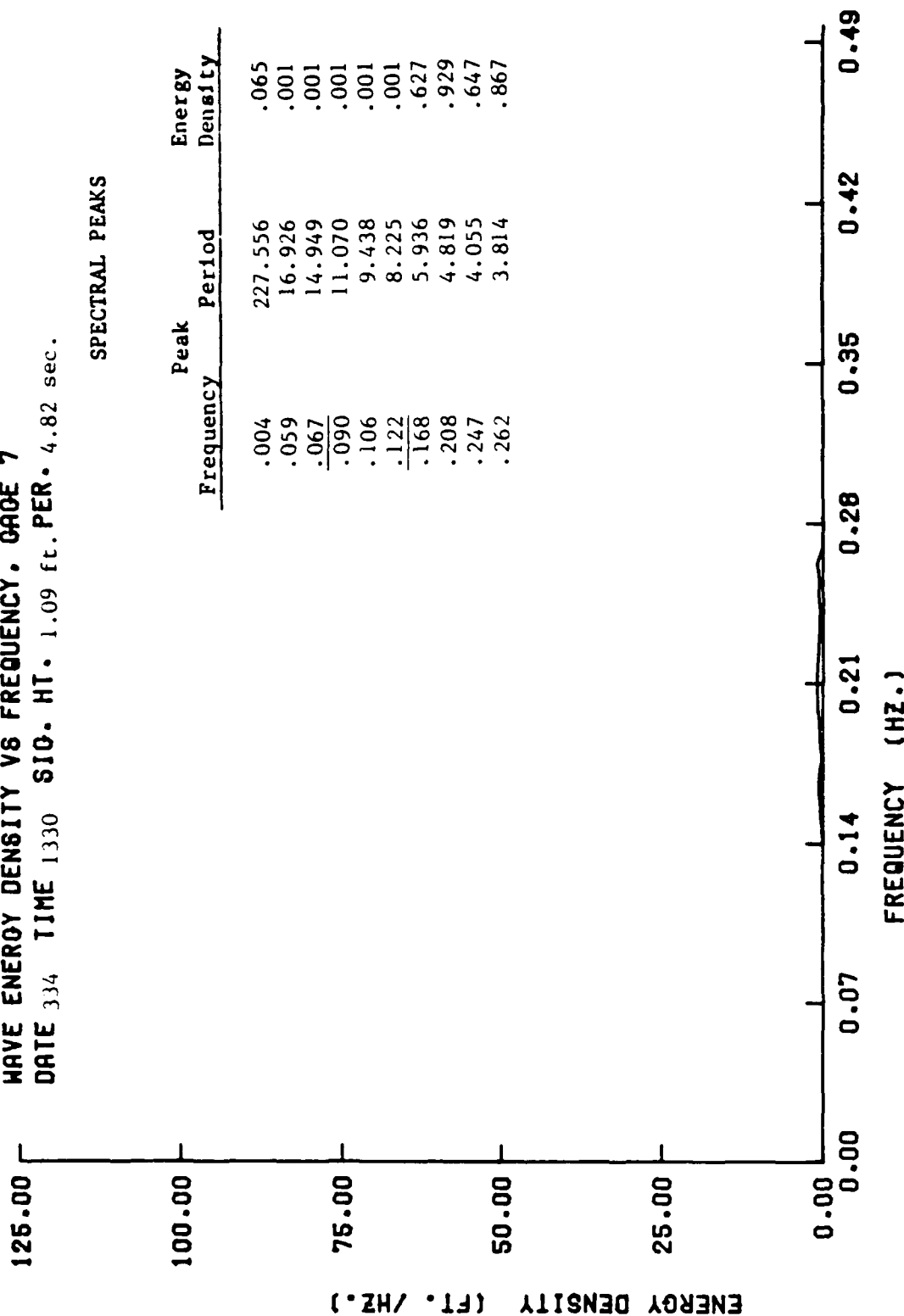
SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
.012	81.920	.628
.067	14.949	.182
.122	8.225	22.644
.137	7.288	85.038
.161	6.225	24.759
.200	5.007	8.275
.239	4.188	6.116
.254	3.931	5.926

LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GRADE 7  
 DATE 334 TIME 1330 SIG. HT. 1.09 ft. PER. 4.82 sec.

SPECTRAL PEAKS

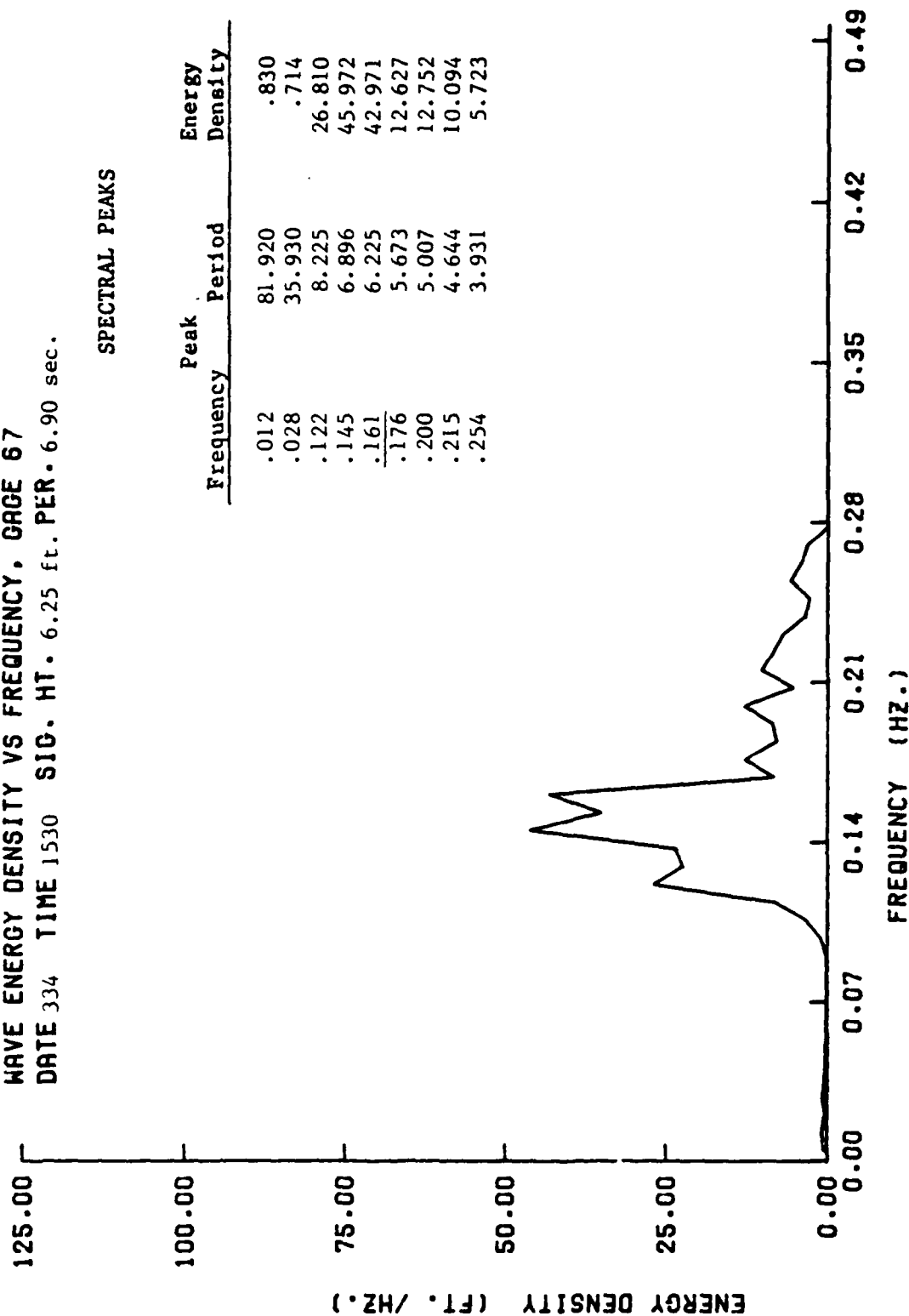
Peak		Energy Density
Frequency	Period	
.004	227.556	.065
.059	16.926	.001
.067	14.949	.001
.090	11.070	.001
.106	9.438	.001
.122	8.225	.001
.168	5.936	.627
.208	4.819	.929
.247	4.055	.647
.262	3.814	.867



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
 DATE 334 TIME 1530 SIG. HT. 6.25 ft. PER. 6.90 sec.

SPECTRAL PEAKS

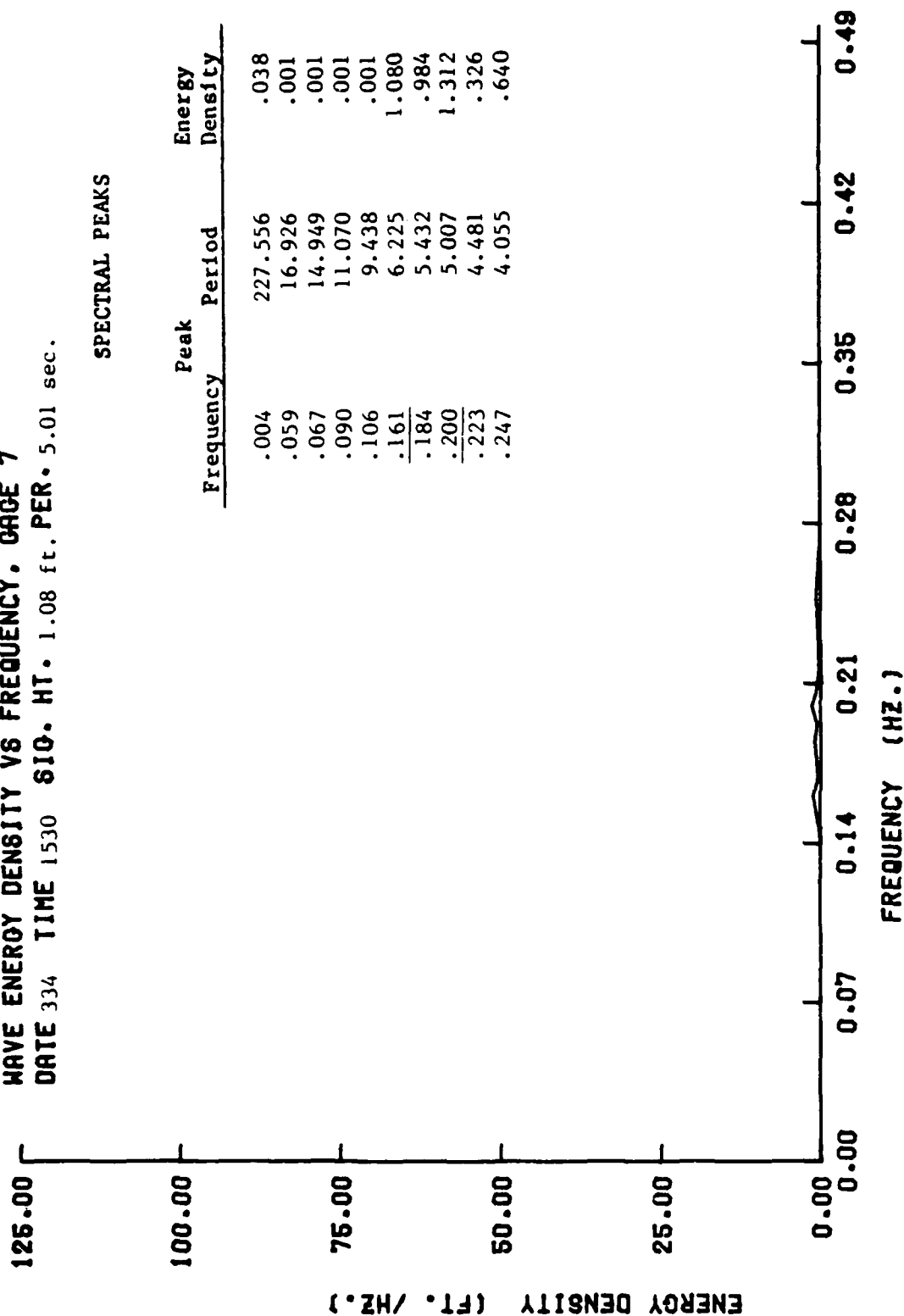
Peak		Energy Density
Frequency	Period	
.012	81.920	.830
.028	35.930	.714
.122	8.225	26.810
.145	6.896	45.972
.161	6.225	42.971
.176	5.673	12.627
.200	5.007	12.752
.215	4.644	10.094
.254	3.931	5.723



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, PAGE 7  
 DATE 334 TIME 1530 SIG. HT. 1.08 ft. PER. 5.01 sec.

SPECTRAL PEAKS

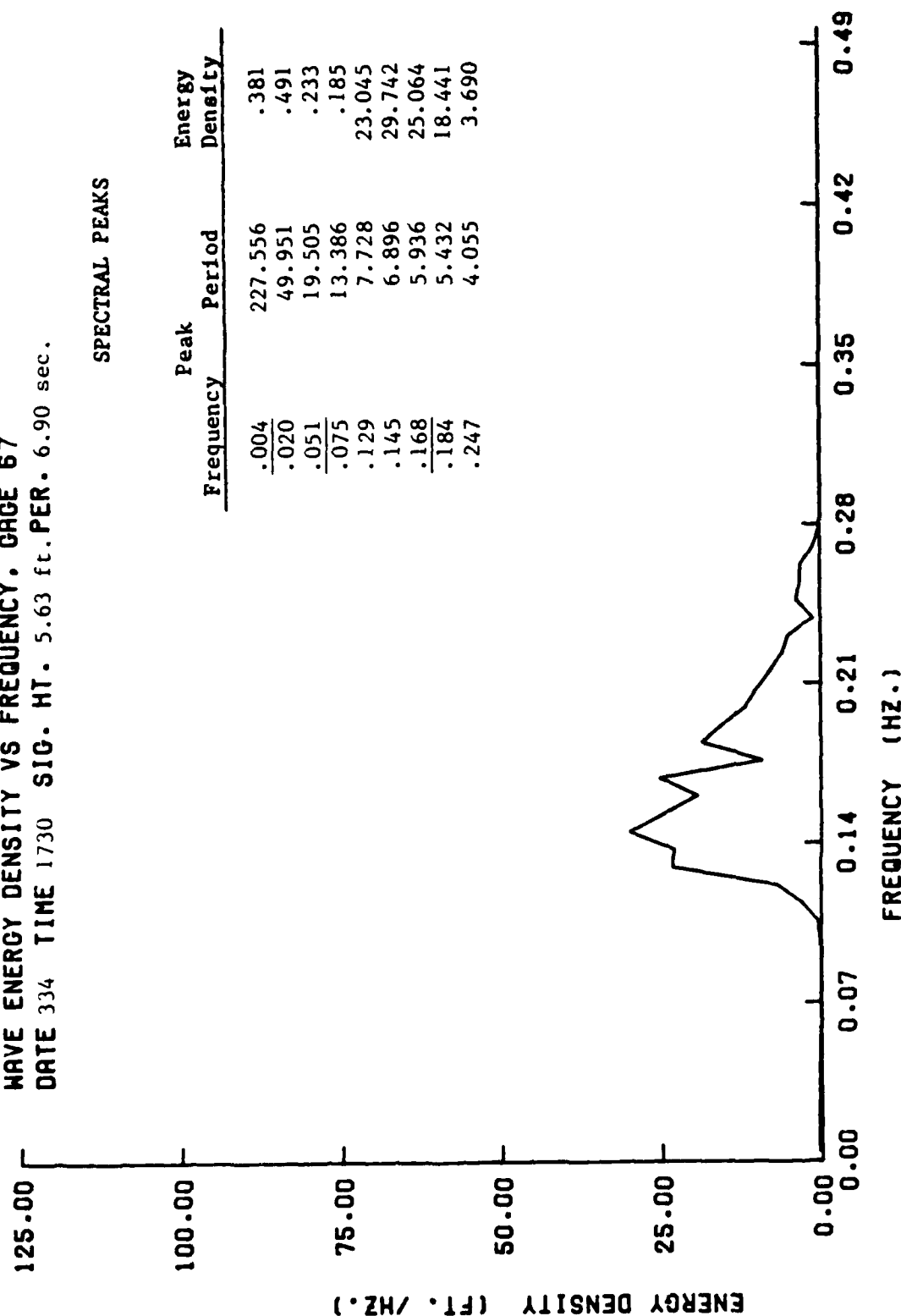
Peak		Energy Density
Frequency	Period	
.004	227.556	.038
.059	16.926	.001
.067	14.949	.001
.090	11.070	.001
.106	9.438	.001
.161	6.225	1.080
.184	5.432	.984
.200	5.007	1.312
.223	4.481	.326
.247	4.055	.640



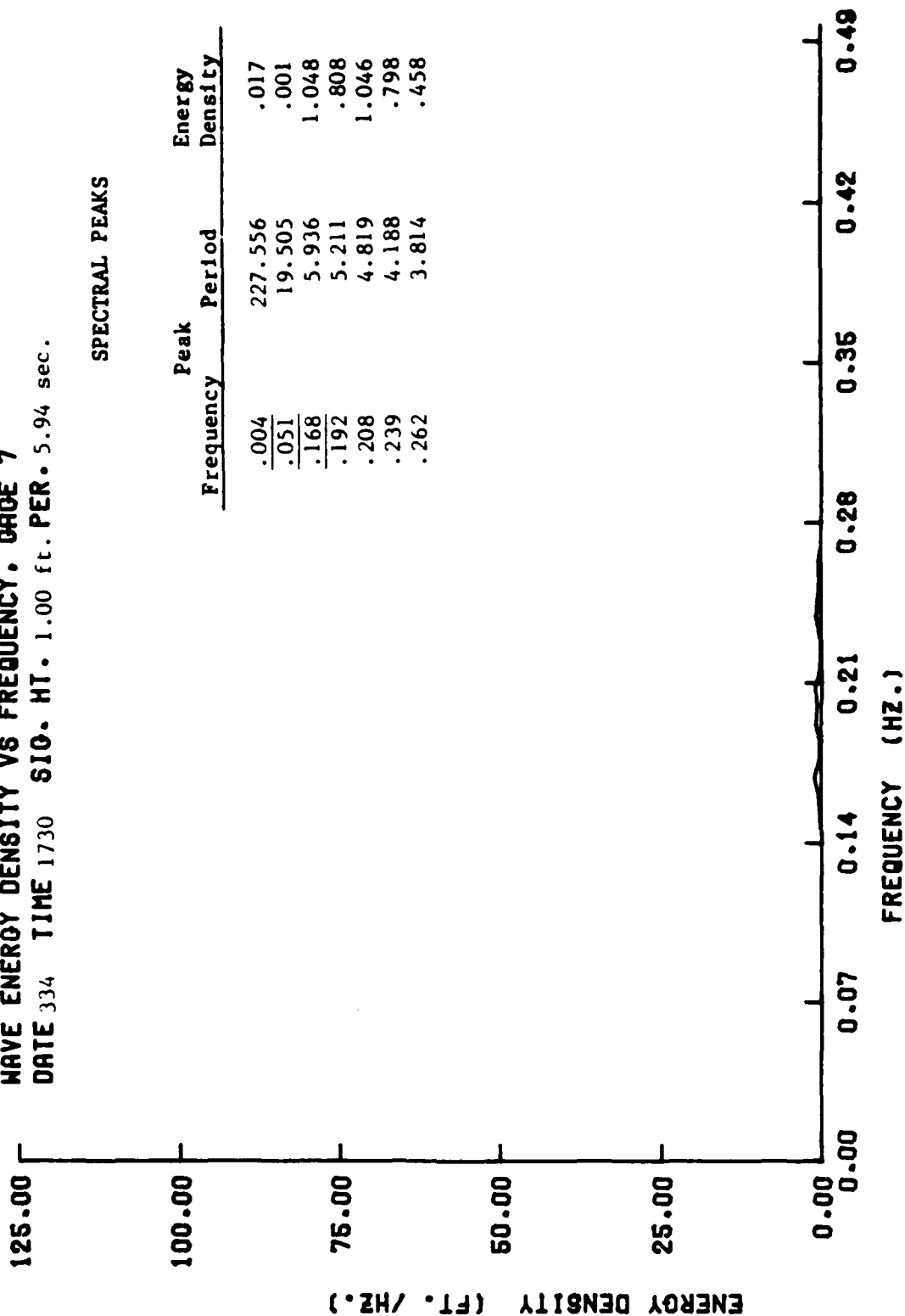
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
 DATE 334 TIME 1730 SIG. HT. 5.63 ft. PER. 6.90 sec.

SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
.004	227.556	.381
.020	49.951	.491
.051	19.505	.233
.075	13.386	.185
.129	7.728	23.045
.145	6.896	29.742
.168	5.936	25.064
.184	5.432	18.441
.247	4.055	3.690



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 7  
 DATE 334 TIME 1730 SIO. HT. 1.00 ft. PER. 5.94 sec.

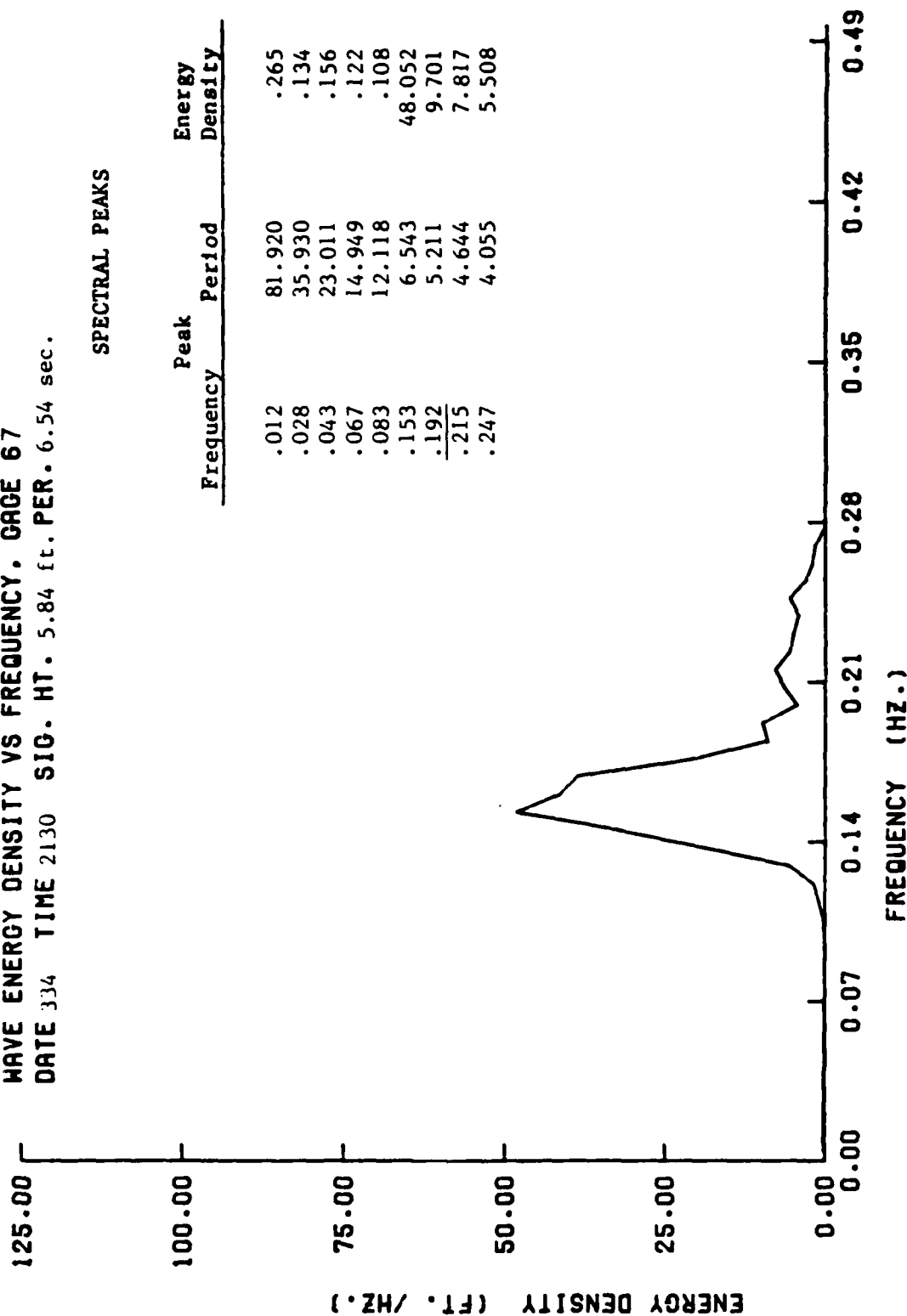




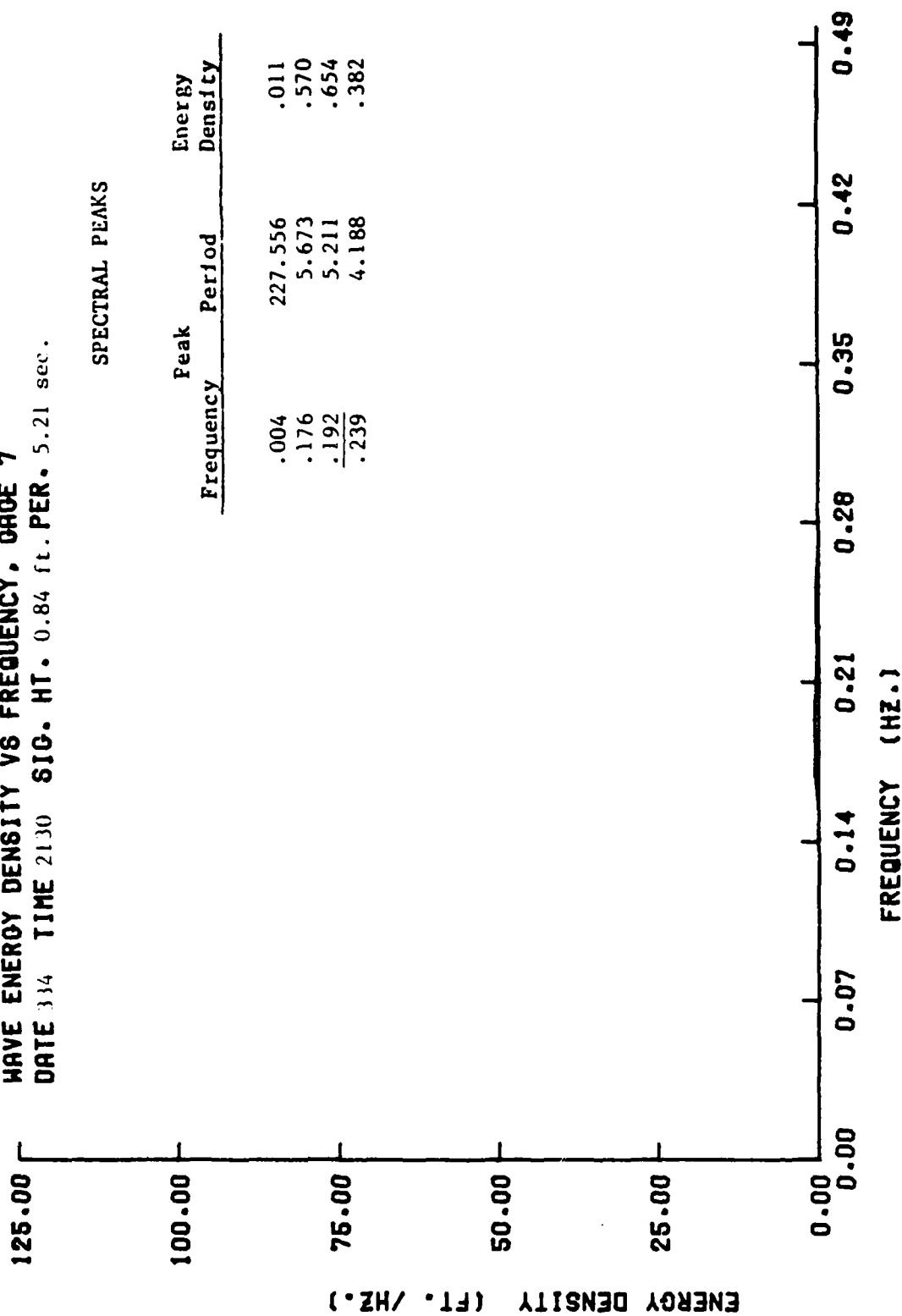
LUDINGTON HARBOR.MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY. GAGE 67  
 DATE 334 TIME 2130 SIG. HT. 5.84 ft. PER. 6.54 sec.

SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
.012	81.920	.265
.028	35.930	.134
.043	23.011	.156
.067	14.949	.122
.083	12.118	.108
.153	6.543	48.052
.192	5.211	9.701
.215	4.644	7.817
.247	4.055	5.508



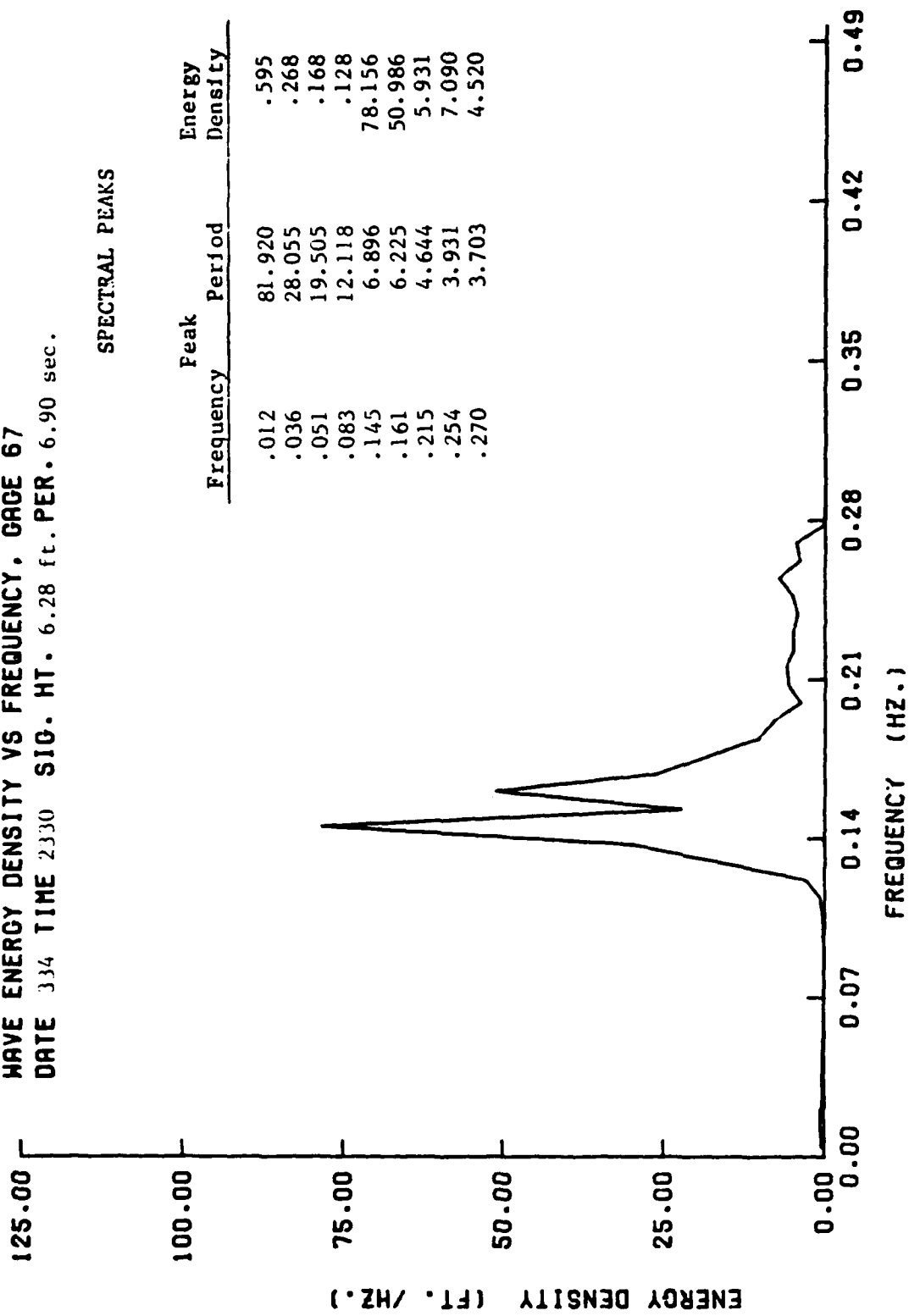
LUDINGTON HARBOR, MICHIGAN  
 HAVE ENERGY DENSITY VS FREQUENCY, GRADE 7  
 DATE 334 TIME 2130 SIG. HT. 0.84 ft. PER. 5.21 sec.



SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
.004	227.556	.011
.176	5.673	.570
.192	5.211	.654
.239	4.188	.382

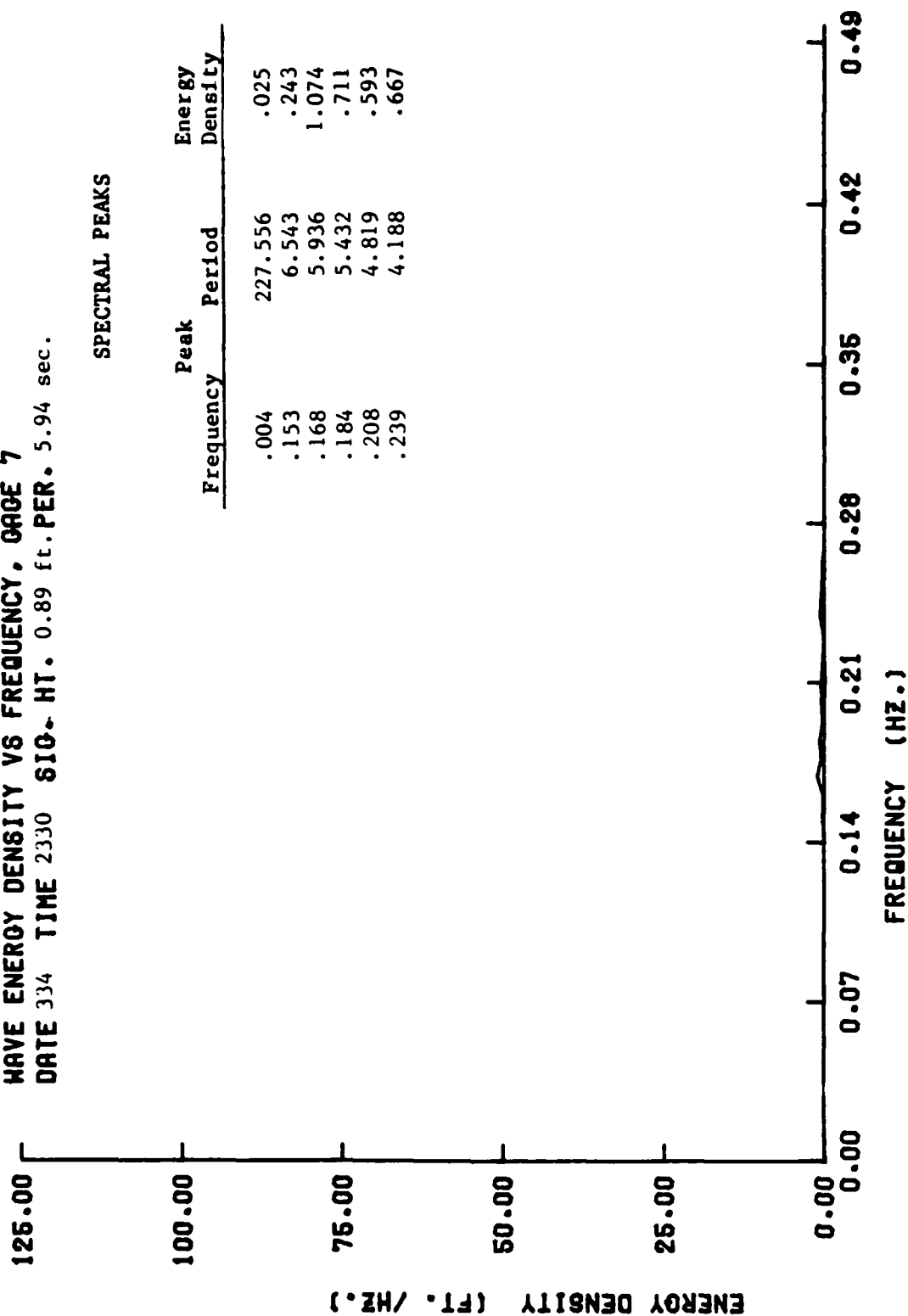
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67  
 DATE 334 TIME 2330 SIG. HT. 6.28 ft. PER. 6.90 sec.



LUDINGTON HARBOR, MICHIGAN  
 HAVE ENERGY DENSITY VS FREQUENCY, PAGE 7  
 DATE 334 TIME 2330 SIG. HT. 0.89 ft. PER. 5.94 sec.

SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
.004	227.556	.025
.153	6.543	.243
.168	5.936	1.074
.184	5.432	.711
.208	4.819	.593
.239	4.188	.667



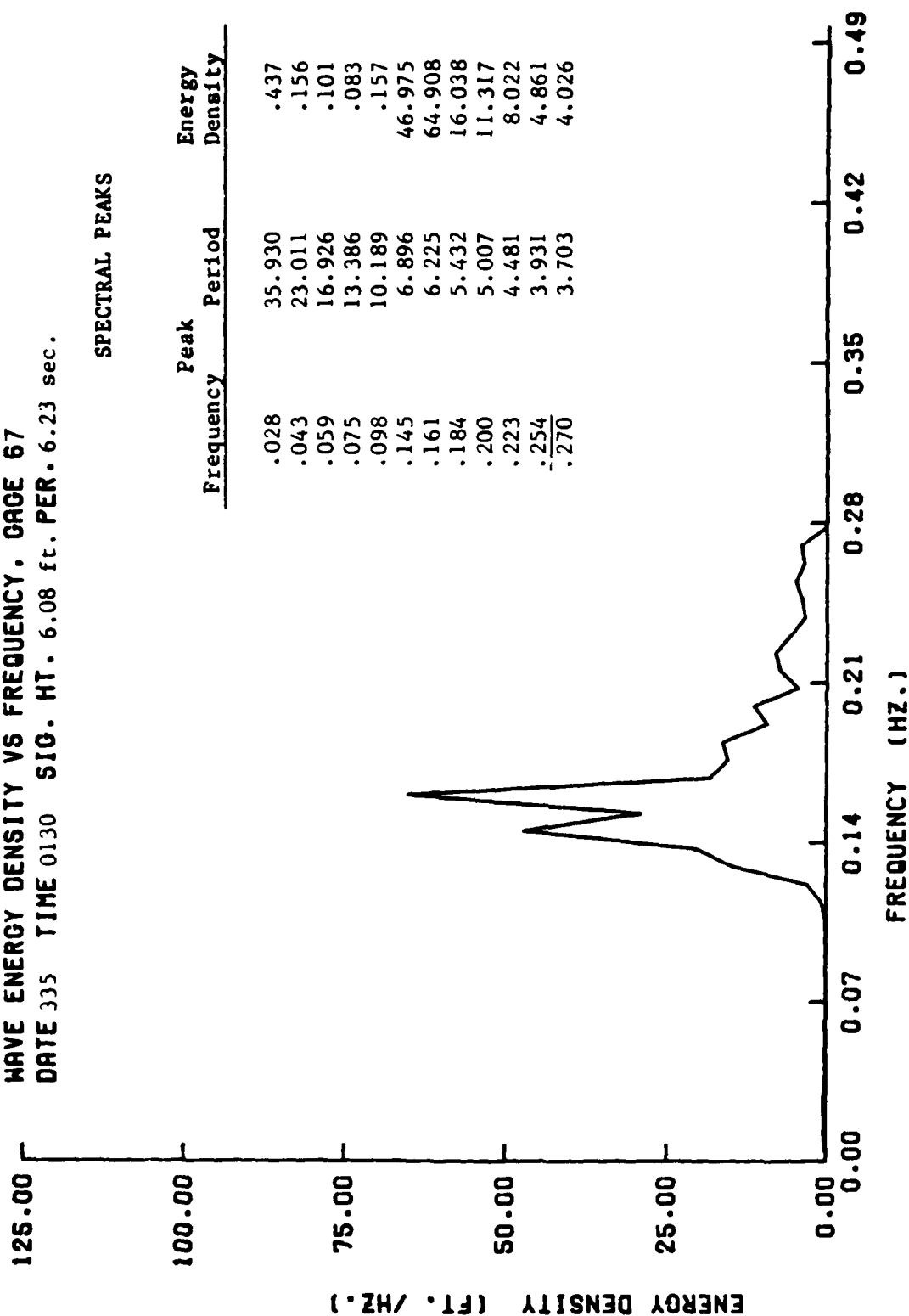
# LUDINGTON HARBOR, MICHIGAN

WAVE ENERGY DENSITY VS FREQUENCY, GAGE 67

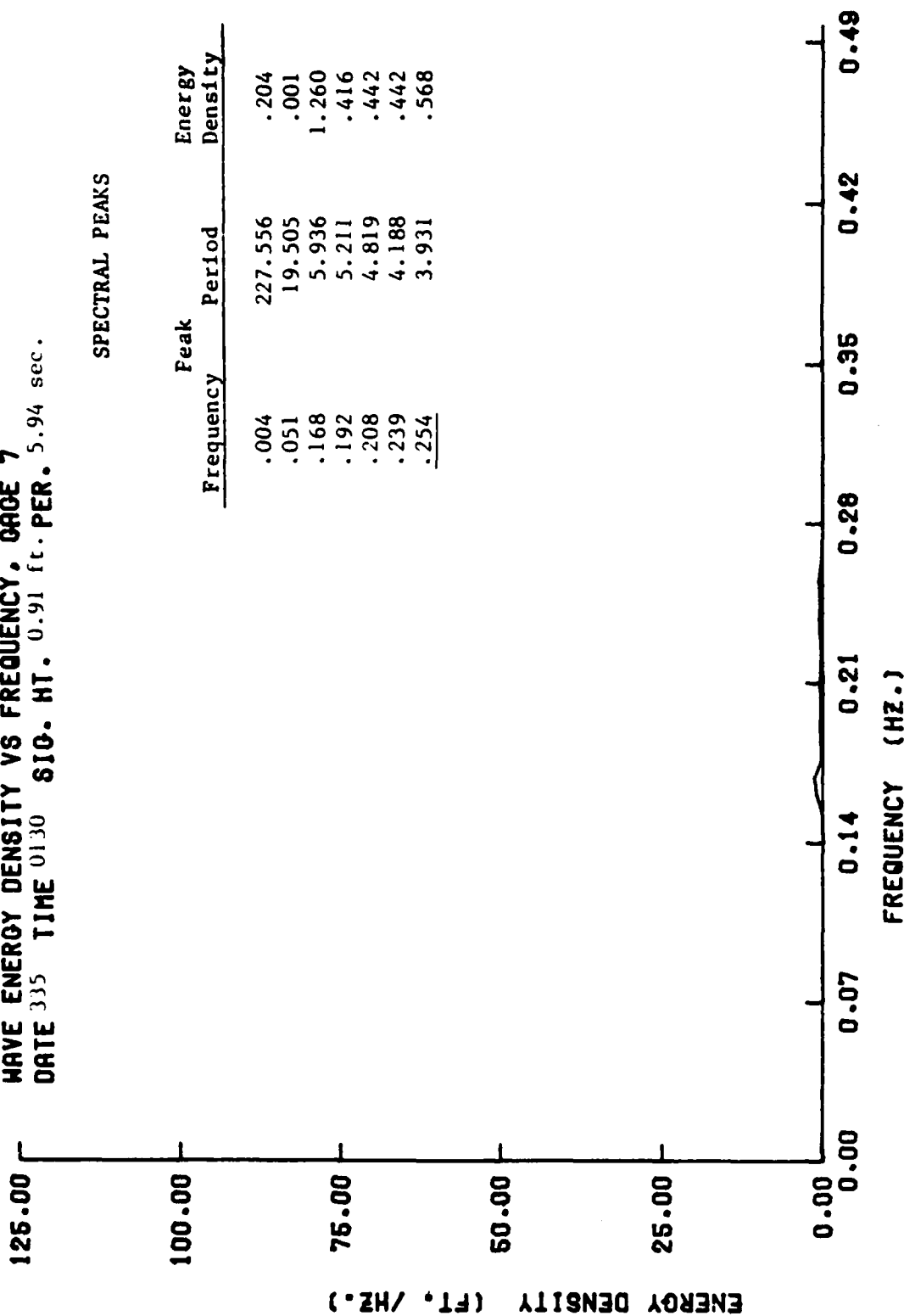
DATE 335 TIME 0130 SIG. HT. 6.08 ft. PER. 6.23 sec.

## SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
.028	35.930	.437
.043	23.011	.156
.059	16.926	.101
.075	13.386	.083
.098	10.189	.157
.145	6.896	46.975
.161	6.225	64.908
.184	5.432	16.038
.200	5.007	11.317
.223	4.481	8.022
.254	3.931	4.861
.270	3.703	4.026



LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY, GRADE 7  
 DATE 335 TIME 0130 SIG. HT. 0.91 ft. PER. 5.94 sec.



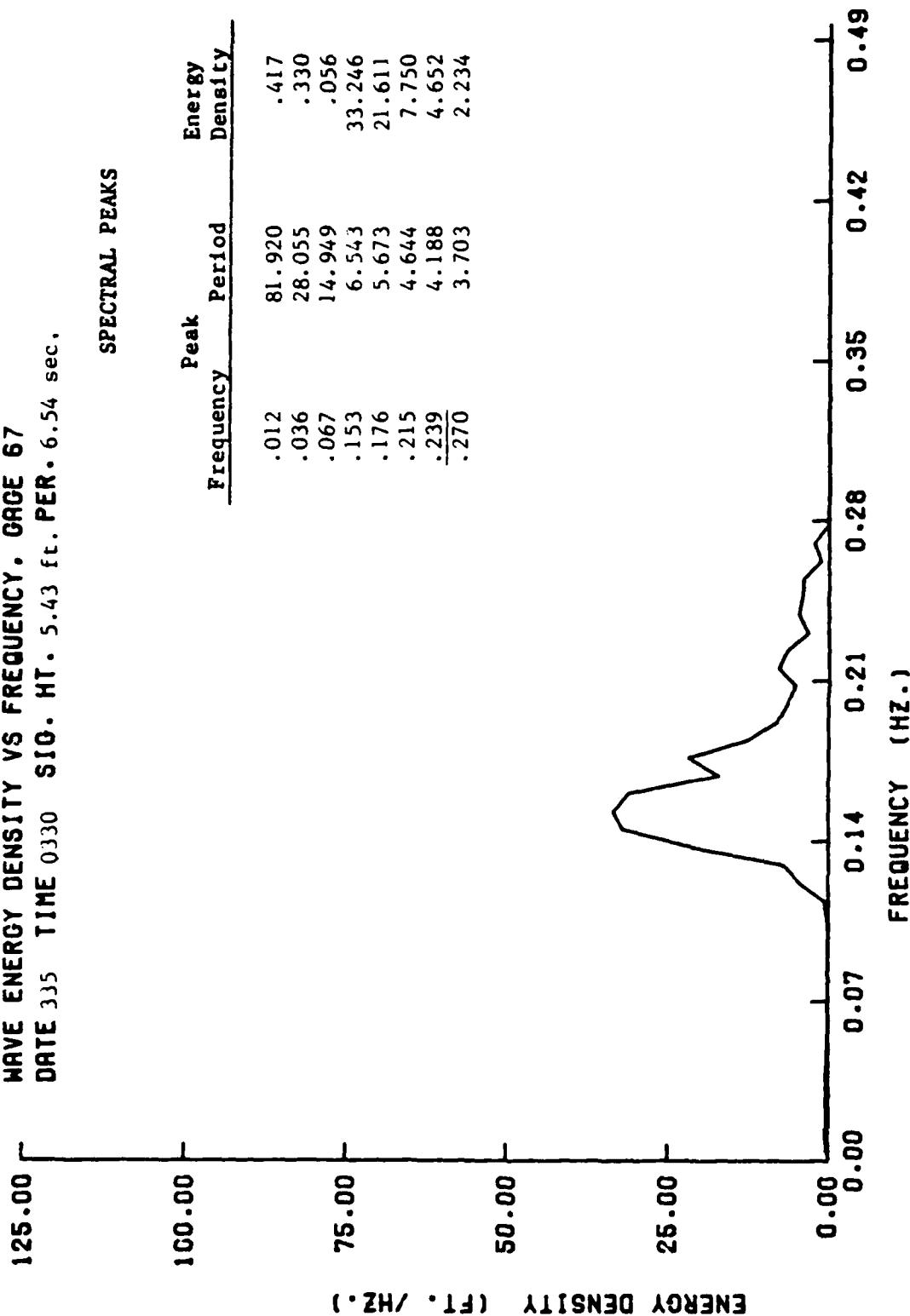
SPECTRAL PEAKS

Peak Frequency	Period	Energy Density
.004	227.556	.204
.051	19.505	.001
.168	5.936	1.260
.192	5.211	.416
.208	4.819	.442
.239	4.188	.442
<u>.254</u>	<u>3.931</u>	<u>.568</u>

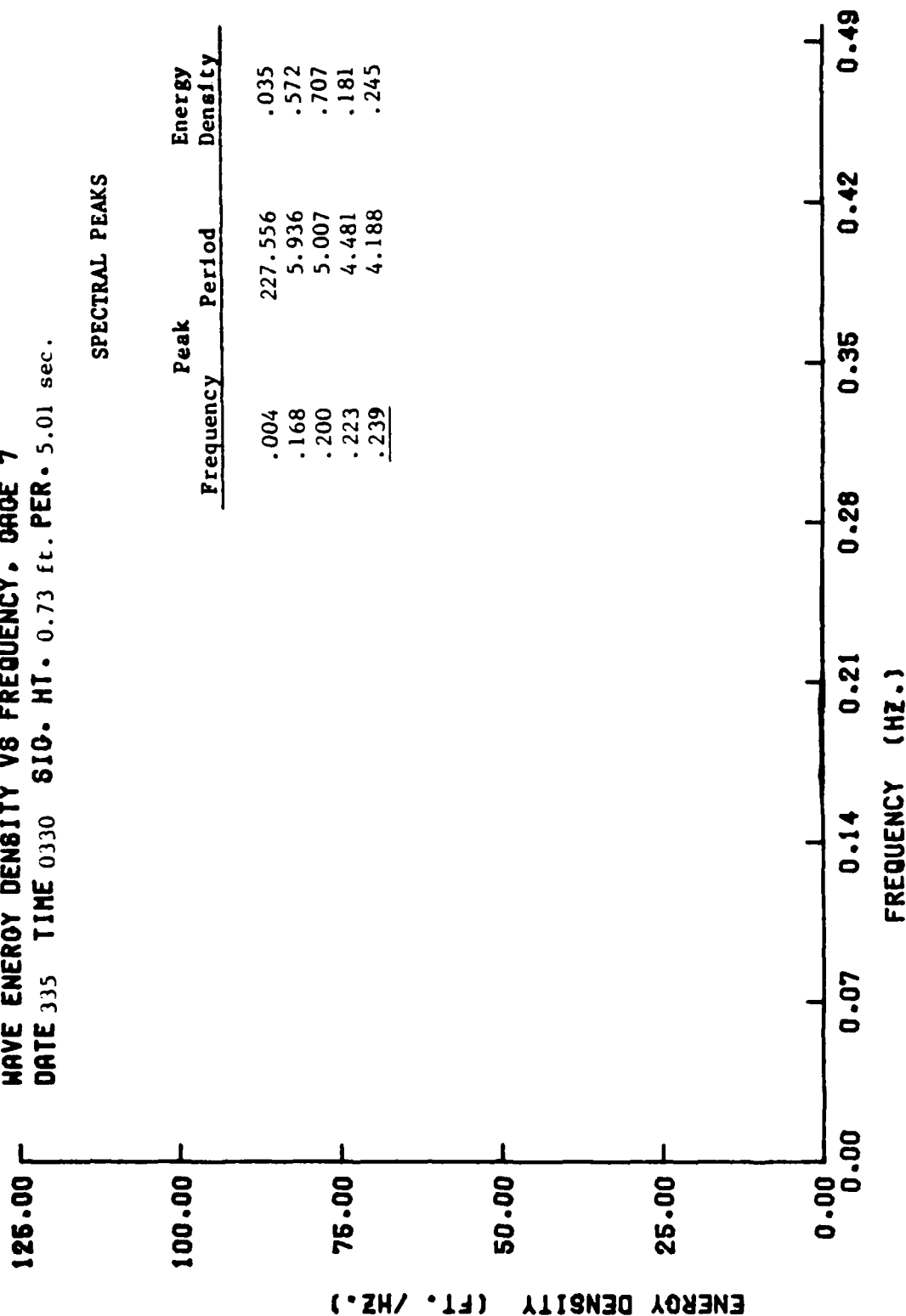
LUDINGTON HARBOR, MICHIGAN  
 WAVE ENERGY DENSITY VS FREQUENCY. GAGE 67  
 DATE 335 TIME 0330 SIO. HT. 5.43 ft. PER. 6.54 sec.

SPECTRAL PEAKS

Peak		Energy Density
Frequency	Period	
.012	81.920	.417
.036	28.055	.330
.067	14.949	.056
.153	6.543	33.246
.176	5.673	21.611
.215	4.644	7.750
.239	4.188	4.652
.270	3.703	2.234



LUDINGTON HARBOR, MICHIGAN  
 HAVE ENERGY DENSITY VS FREQUENCY, PAGE 7  
 DATE 335 TIME 0330 SIG. HT. 0.73 ft. PER. 5.01 sec.





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